UNIVERSITY OF GOTHENBURG

Hand gesture production and gestural co- activation

A study on a Cuban-Cuban and a Cuban-Swedish first time encounter

ANNIA TERESA GARCIA CRUZATA

Master of Communication Thesis

Report No. 2013:080
ISSN: 1651-4769

University of Gothenburg
Department of Applied Information Technology
Gothenburg, Sweden, June 2013

Dedicatory

I would like to dedicate this Master Thesis to my parents Vicenta and Félix, who love me unconditionally and who always have and will support me. I would also like to dedicate this thesis to my brother Félix M., for being a brother I am proud of, and to my grandma Arabella for inspiring me to go to China. Gracias por todo!

Acknowledgements

I would like to thank my supervisor Inga-Lill Johansson for her constructive feedback, her patience and understanding, her immediacy to answer all of my questions in time, and her availability to meet me whenever I needed.

I would like to thank my co-supervisor Güllüzar Tuna for her availability to meet me any time I needed, her help during the filming of the videos, her instructions on installing and using the video annotation tool ANVIL, her sharing of her knowledge and tips on relevant literature to my study. I would also like to thank her for conducting the reliability test for my video annotations, and for always meeting me with a smile!

I would like to thank my boyfriend, Per Bergqvist, for his support and his help proofreading my thesis.

Last but not least, I want to thank my family and friends wherever they are.

Abstract

The present paper studies the hand gesture production in number and type of two Cuban participants and a Swedish one. The first time encounters between the two Cubans, and between one Cuban and the Swede were filmed. The interactions lasted around 7 and 10 minutes, respectively. The hand gestures of all participants were annotated for each video, as well as their gestural co-activation (including all parts of the body, not only the hands). The results showed that the Cuban participants produced a remarkable larger amount of hand gestures than the Swedish participant. There were more similarities than differences in the amount and type of gestures produced by the Cubans, and more differences than similarities between them and the Swede. When it comes to gestural co-activation, participants co-activated almost the same amount of time as their interlocutor in each video. However, the Swedish participant did more reformulations than repetitions, while the Cubans did more of the later.

Keywords: *Hand gesture, gestural co-activation, culture, mono-cultural, intercultural, nonverbal communication, Cuba, Sweden*.

INDEX

1 Introduction

Communication takes place not only through words, tone of voice, stress given to words, but also by means of several gestures, such as facial expressions, gaze, head movements, hand movements, and body posture, which usually accompanies human speech (Cerrato and Skhiri, 2003).

The study of gesture has a long story. The first book devoted in its entirety to it appeared in the beginning of the 17th century (Kendon, 1986). Throughout the years, researchers have thought there was a link between gestures and the origin of languages and thought (Kendon, 1986). However for a long part of the 20th century the study of gesture was neglected, only to be retaken at the end of said century (Kendon, 1986, 1997).

Although it has been thought that people gesture because we see and learn from each other, a study points out that even people who are blind from birth can produce the same types of gestures seeing people make, and even children start producing gestures before developing language (Iverson and Goldin-Meadow, 1998)[1].

People from all cultural and linguistic backgrounds produce gestures (Iverson and Goldin-Meadow, 1998). However, it is well known that different cultures use gestures differently (Cavicchio & Kita, 2013). For instance, some cultures have been described as rich —or high— gesturing cultures (such as Italy and North America) while others have been described as low gesturing ones (UK and China, for instance) (Kendon, 1992; Kavakli and Nesser, 2012). This means that in some cultures people produce more gestures than in others, and/or their gestures are bigger in size or intensity.

It is well known that different cultures have different gestures for the same situation, and this can, of course, provoke misunderstandings. However, the number and intensity of gestures can also be reason of intercultural communication problems. For instance, Macauley and Nakatani (2006) mention that although Japanese people do not gesture often, they do gesture more than Americans in happy situations, which Americans interpret as excessive or insincere. So, not only the differences in the gesture as such, but also on their number and intensity can be a source of miscommunication between the two cultures (Macauley and Nakatani, 2006).

Coming from Cuba and living in Sweden, I have found several differences in the way people from both countries gesture. In my eyes, Cubans gesture much more with their hands than Swedes do, and their movements are bigger and more intense. Although neither country has been explicitly classified as low or high-gesturing by the Literature I checked, it does have been said that people from North Europe make less extensive use of gestures than people from the Mediterranean countries, and that Spanish is supposed to be a high frequency gesture rate language (Cavicchio and Kita, 2013).

Is Cuba a rich-gesturing culture and Sweden a low-gesturing one? This is only one of the questions I will try to address with this paper. I will not be able to answer it (due to my limited data), but I hope my results will at least hint to an answer.

[1] Iverson and Goldin-Meadow (1998) do not mention the influence of culture in gesture production (some gestures, like thumbs up, may need to be seen before being reproduced).

1.1 Aim of the Study

This thesis has two main purposes: to find out similarities and differences in the amount and type of hand gestures that two Cuban women and one Swedish woman produce during their first time encounter— one interaction is between the two Cubans and the other interaction involves one of the Cubans and the Swede, —and to describe how gestural co-activation occurs in both encounters.

One assumption is that since gestures occur more frequently in cultures such as Hispanic[2] than in others (Macauley and Nakatani, 2006), then the Cuban participants will produce more hand gestures than the Swedish participant. Another assumption is that in the mono-cultural interaction, the participants will co-activate each other more than in the intercultural interaction since, according to Allwood and Lu (2011), "the more similar interlocutors are regarding cultural/ethnic, linguistic, and gender/biological background, the more co-activation takes place, especially in the form of repetition." Allwood and Lu (2011) also claim that people adapt to each other in human communication, so this study is also concerned with trying to find out if the Cuban participant that appears in both videos (C1) changes her communication patterns (in this case, produces more or less gestures) according to the patterns of the other two participants.

The Communication Accommodation Theory (CAT), however, states that people interacting can both reduce and magnify communicative differences among themselves (Giles, 2008). So, another research question will be to find out how much participants accommodate and/or magnify their differences in each interaction. This will be studied by finding out if the amount of gestures of participant C1 (see the Methodology section) is consistent in both interactions.

1.2 Research Questions

Usually, gestures are evaluated with respect to their number or with respect to their communicative function (Hogrefe, *et al*., 2009). In the present study, I will focus on the number and type of hand[3] gestures produced by all subjects.

I choose to not study the function or meaning of gestures, since this kind of study is normally done in an interpretative or hermeneutic approach in which the researcher carefully observes gestures and their accompanying speech, and tries to infer a meaning from that relation (Krauss *et al*., 1993). Like Kraus *et al*. (1993) I believe that although this approach may and have resulted in useful insights, I do not feel comfortable in using an approach that is so heavily dependent on the researcher or observer´s interpretations. So, instead, I chose to study the number and types of gestures produced by the participants.

One reason why I chose to focus on hand gestures (instead of other parts of the body) is that the majority of the kinesics manifestations are produced mainly by using the hands and arms[4] (Herrera, 1999). Another reason is that gesture recognition is a

[2] Hispanic means Latin American, for the purpose of this paper.
[3] Hand gestures include the arms in this study, but not the shoulders.
[4] And the head.

challenging problem (Wang *et al*., 2006) due to the fact that some movements, such as those of head and arms are very subtle and can happen at various timescales (Wang *et al*., 2006). That is why it would have been a very difficult task to focus on the gestures produced by more than one body part. In addition, due to unavailability of cameras, I could not film the faces of the subjects, which also makes it almost impossible to notice all the face gestures they made.

Although one focus of my study is the hand gestures of the participants, I will also consider movements of other parts of the body, such as head and leg movements, body posture, and well-defined head movements in order to find out to which extent co-activation occurs in each video. In the case of the head movements, my annotations should be taken only as an estimate, since there were many subtle movements subjects make (especially when giving feedback) that I could not see clearly due to the technical problems (the use of only one camera to film the whole scene and the poor resolution of my laptop screen). So, when it comes to head movements in co-activation, I annotated only those that were clearly obvious and visible.

My research questions are:

a) What are the similarities and differences in the number and type of hand-gestures the Cuban participants produce?

b) What are the similarities and differences in the number and type of hand gestures produced by the Swedish participant compared to the Cuban ones?

c) How often does co-activation happen in each interaction, and what types of co-activation occur?

d) How does the Cuban participant that appears in both videos interact with her interlocutors in regards to accommodation and/or magnification of their hand gestures.

1.3 Contributions of the study

The study of human communicative gestures is becoming more and more popular in the field of human-machine interfaces and speech technologies development. This is due to the fact that researchers are becoming more aware of the fact that gestures play an important role in communicative exchanges (Cerrato and Skhiri, 2003). Therefore, the results of this study could be used in the construction and improvement of embodied conversational agents or avatars.

Nowadays more and more websites—especially profitable ones— are using this kind of agents to interact with customers, for instance the agent Anna on ikea.com (Lind and Salomonson, 2006). According to Allwood (2008), these avatars are becoming more and more human-like, in the sense that they are able to reproduce emotions and attitudes. This could be thanks to the fact that "researchers, being aware of the important role that gestures play in communicative exchanges, are starting to integrate some of them in the development of dialogue systems endowed with embodied conversational agents, with the aim of enhancing their performance" (Cerrato and

Skhiri, 2003). However, there are great differences in how people communicate with their bodies (Alwood, 1985). For instance, gestures for things such as money or "come here"—to mention a few—vary considerably between countries and/or geographical regions (Allwood, 1985). Therefore, if a corpora of multimodal communication from different cultures or geographical regions exist, then these avatars could be designed to behave more like the public that is viewing them (for instance, for a Swedish website, the avatars would make gestures and/or facial expressions in a similar way as the multimodal corpus for Swedes describes, while an avatar for, in this case, a Cuban audience, would have similar gesture production to what the corpora shows for Cubans nonverbal communication).

This study can also contribute to building up a multimodal corpus of speech and gestures; in this case both mono-cultural and intercultural. (Culture will be used in the present paper as "national culture". More information about the definitions can be found in the theoretical framework section). The fact that the dialogues take place mostly in Swedish, can also help the major effort that the international community has been making over the last years in order to extend the number, variety and size of annotated multimodal corpora in several languages (Ferré, 2010).

On top of the above mentioned, Allwood (2008) states that "a multimodal corpus (…) provides an opportunity to include information of a contextual and cultural kind. This means that multimodal corpora are excellent instruments for a more holistic documentation of cultural and linguistic processes." So this paper or, at least, the videos filmed for the purpose of this study, could contribute to enrich, clarify and even raise questions on cultural and linguistic issues. (See some of these issues in the section Discussion and Conclusion).

The multimodal corpus that this paper aims to help build and/or enrich could also be used for actors and movie directors, when portraying characters from a different cultural background than their own, as well as for cartoon artists when creating animation characters representing different nationalities.

Another importance of this study on nonverbal communication is to help to or attempt to fill up the information gap that exists online about the communication style and patterns of Cuban nationals. No relevant studies about the topic of how Cubans gesture appeared when I searched for it online in both English and Spanish languages.

For the purpose of Communication research, all countries and/or cultures are worth studying. In the specific case of Cuba, it is the largest island in the Caribbean and has a strategic geographical position between Florida in the United States and Mexico. Also, although Cubans represent only the 3,7% of the Latin population in the United States, Cuban-Americans are considered as one of the most successful minorities there (Bernal, 2005). At the same time, although Cubans share many of the cultural patterns of the rest of Latin America (Bustamante y Santa Cruz, 1975; Ortiz, 1973, as cited in Bernal, 2005), its exceptional political, economic and social situation in the American continent may have contributed to a different way of behaving and communicating.[5]

[5] Some differences between Cuban and the rest of Latin America are: Cuba is a Communist country, health care and education are free, religion does not have a big importance in the society, equality between women and men is encouraged by the government, Internet access is very limited, abortion and divorce are legal, the society is not openly divided into classes, etc.

1.4 Previous Research

Many studies that analyze the production of gestures on first-time encounters have been conducted. For instance, Allwood and Cerrato (2003) studied the relation of gestures to verbal feedback expressions. Their results were based on four video recordings of interactions between a travel agent and four different customers who were asking for information. All participants were Swedes and the findings were that "feedback is mostly expressed simultaneously by vocal/verbal and gestural means" (Allwood and Cerrato, 2003).

Another video-based research by Allwood and Lu (2011) studies how co-activation takes place in mono-cultural and intercultural interactions in first-time encounters. This study is similar to mine in the sense that I also studied both mono-cultural and intercultural first time encounters, respectively, and in both studies participants´ gestures play an important part. However, although I am also concerned with the concept of co-activation, another research question of mine is the number of hand gestures produced by the participants, which Allwood and Lu do not refer to.

A study that is currently being conducted (as of May 2013) by Allwood *et al.* (2013) investigates how people show interest in first-time encounters. 24 participants—all Swedish university students—were filmed, resulting in 14 videos (two participants appeared twice). According to the results of this study "interest occurs mostly together with the speech act of feedback". Although I am not specifically focusing on feedback, more than 50% of unimodal gestural co-activation occurs in the shape of feedback (Allwood and Lu, 2011). So, this study on feedback is implicitly very related to mine.

A study by Kendon (1997) describes the integration of gesture with speech, as well as outlines cultural differences in gesture and the possible relationship between these differences and language differences. He states that "some aspects of cultural differences in gesture may follow from languages differences, whether in prosody, syntactic patterning, or the way a language describes things". This can be relevant in the case of the inter-cultural interaction of the present study. Both participants speak each other´s mother tongue, so I anticipated that the conversation would take place in either Spanish or Swedish. The language "chosen" may have influenced the gestures speakers made, though I do not attempt to find out to which extent. (In order to know this, it would be needed to film the Swedish participant in interaction with another Swede, and then compare both mono-cultural interactions (Cuban-Cuban and Swede-Swede) with the inter-cultural one and find out if the participants exhibit any significant differences in their gestures when talking to a fellow countryman than with a person from a different nationality.

In 2011, researchers from the University of Tartu, in Estonia, carried out a study with the purpose of describing nonverbal communication in conversations, focusing especially on the interlocutors´ synchrony and copying of each other´s behavior. The mono-cultural study was based on two videos of four Estonian participants (though only three people appeared in each video). The conversations were in the form of "role-play" and, therefore, not in a completely natural and spontaneous setting. Still, the researchers were able to code many gestures and body movements that prevailed

in the interactions, such as crossing hands, hands on chin, gaze, posture and hand movement, to mention a few.

In 2012 two researchers from the Department of Computing at the Macquarie University of Sydney, compared the hand gesture number, type and frequency produced by five Anglo-Celtic participants to those of five Latin American ones. This study was not based on interpersonal interactions, but rather on monologues that each participant performed individually in front of a camera. The subjects were asked to describe two chairs and encouraged to gesture as much as possible and use both hands. Although the method was not at all like the one employed in my study, the purpose of the investigation as such was quite similar to mine—to compare hand gesture production mono and interculturally.

Macauley and Nakatani (2006) conducted a study that, like mine, was aimed at finding out the number and type of gestures that participants produced. The purpose of this study was, however, to determine to which extent language and culture influence the gesture production. The participants were 8 bilingual (English and Japanese) Japanese people living in the United States. The participants did not interact with each other but talked individually to a camera in both English and Japanese, and the gestures they produced while speaking each language were studied. The result showed that the participants produced twice the amount of emphasis gestures when speaking English than when speaking Japanese (other types of gestures remained the same in number).

All in all, several communication video-based studies on gesture production have been conducted. Some have been spontaneous interactions in which participants have freedom of topic and some have been staged, where participants have been given a hypothetical situation and assigned a role. In all cases, there is an element of "unnaturalness", since there are always cameras involved. In some cases this unnatural element has been more obvious, like when encouraging participants to act in a specific way (such as gesturing and using both hands). Some have focused purely on gestures and some have also taken utterances into account. No studies between Swedes and Cubans seem to have been made so far, or between Cubans. Also, in most of the studies reviewed above gestures are studied in their function and not in their number.

2 Theoretical Framework

In this section I will provide definitions to different concepts and terms that are mentioned throughout the study, as well as explain how I interpreted and applied them. I start with an overview of the term "gesture", its definition and some issues related to it. Then I will give an overview on how typically both Swedes and Cubans gesture in conversations. Since there is no relevant (online) information on Cubans, I will refer to other nationalities that are culturally, historically and geographically close to Cuba, and/or to classifications in which Cubans fall, such as "Latin-American" or "Spanish speakers". Then I will delve into the concept of co-activation, which is also a topic of my research questions. I will explain the different types and shapes in which co-activation takes place, and how I applied them to my study.

Finally, I will refer shortly to other concepts and terminology that are present in this study.

2.1 Gesture

The definition of gesture is a bit controversial or, at least, one in which researchers are not all in complete agreement.

According to Kress (2009), gesture is realized as a sequence in time of the movement of arms, hands, head and facial features, as well of their simultaneous display against a stable spatial frame of the upper part of the torso. McNeill (1992) defined gestures as the movements of the hands and arms that occur simultaneously with speech. In conformity with these two definitions, body movements from the waist down would not be considered gestures.

However, the online version of the dictionary Merriam Webster defines gesture as "a movement usually of the body or limbs that expresses or emphasizes an idea, sentiment, or attitude". Following this definition, the movements of legs and feet (limbs) would also be considered gestures. The online version of Oxford dictionary is more vague and, at the same time, general. It states that a gesture is "a movement of part of the body, especially a hand or the head, to express an idea or meaning."

According to Kendon (1986) a definition from the Oxford dictionary stating that a gesture was "a movement of the body, or any part of it, that is considered as expressive of thought or feeling" is extremely broad, since there are expressive actions humans make that are not exactly gestures, such as crying (unless we mean that the crying is fake). He also states that certain movements people make when they are nervous, such as self-grooming, clothing-adjustment and/or repeatedly touching an object such as a necklace are not usually considered gestures either. Spatial orientation, social activities such as smoking or drinking are also not considered gestures. Kendon suggests that movements should be analyzed in relation to other movements, some of which will have a higher degree of expressiveness. The higher this degree is, the more this movement stands up in comparison to other movements in its function of conveying meaning. In summary, to Kendon (1986) "gestures are those movements that partake of these features of manifest deliberate expressiveness to the fullest extent".

Kendon´s definition of gesture introduces an element of subjectivity, since it is up to the viewer to decide the level of expressiveness an action may have. In my study, I understand by "gesture" any movement of the body (including head, limbs, and trunk) that conveys a meaning. However, when it came to the number and type of gesture, I focused only on hand gestures. However, when any kind of movement (gestural or not) occurred, I checked if the interlocutor imitated them, since one of my research questions is to find out to which extent participants mirror each other.

2.1.1 Categories of Gesture

According to Sainsbury and Wood (1977) there are four categories of gestures:
adaptors (apparently superfluous movements every one makes such as fidgeting);

descriptive gestures (those we make as an aid to speech, to convey an idea or meaning); emotional or communicative gestures (they serve to convey feelings and emphasis); and individual´s total activity (expressive and purposive gestures or goal directed ones, such as smoking and knitting).

However, Krauss *et al*. (1993) do not consider adaptors (they call them adapters) should always be considered gestures. They state that all hand gestures are hand movements, but not all hand movements are hand gestures, and this is often the case of adapters. To Krauss *et al*., adapters[6] include touching of one self (scratching, rubbing, touching one´s own hands) or of some object (touching a pencil, eyeglasses or one´s own clothes). Krauss *et al*. (1993) express that although this type of hand movements may unconsciously convey information about the doer (nervousness or boredom, for example), they are often not considered gestures, since they are not perceived as communicatively intended or meaningfully related to the speech they accompany. In line with this reasoning, I did not consider adapters as gestures in this study. So, the movements that participants did like scratching, fixing their clothes, or touching their own hands—just to mention a few—were not annotated.

2.1.2 Gesture Interval

A gesture interval is a gesture state that has three phases: preparation, nucleus and retraction (Tsai, 2012; Hassanpour and Shahbahrami, 2010).

- Preparation: it is when the body part involved in the movement prepares to leave its initial resting position. This phase is sometimes very short, and it can also be combined with the retraction phase of the previous gesture.
- Nucleus (also called peak or stroke): this phase has a definite form it represents the core of the gesture interval as such.
- Retraction: it is when the body part goes back to its initial resting position, repositions for a new gesture phase or—although not mentioned in the reference—adopts a new resting position (Hassanpour and Shahbahrami, 2010).

2.1.3 Gesture Sequence

Gesture sequences are situations in which an individual uses more than one gesture one after another for the same end during a delimited period of time (Tomasello *et al*., 1994) and often have a complex underlying structure (Wang et al., 2006). A gesture sequence may contain several distinct and important gestures (Tsai, 2012). From these references, I interpret that the authors mean that a gesture sequence may be made of different gesture intervals. And this is the way I am using the definition in my paper (see more in the section Coding).

2.1.4 Gestures by Cuban people

As mentioned before, there is no relevant bibliography on the subject of how Cubans gesture. However, there is some information about Latin American people and native

[6] Adapters are also referred to as *expressive movements, body-focused movements, contact acts, self-touching gestures and manipulative gestures, self-manipulators and manipulative gestures* (Krauss *et al*., 1993).

Spanish speakers in general. Although not ideal, I will try to form an idea of the way Cubans gesture, by gathering information from the mentioned groups since, at least in relation to the first group mentioned, Cubans share many Latin American cultural patterns (Bustamante y Santa Cruz, 1975; Ortiz, 1973 as cited in Bernal).

Some relevant asseverations on the topic are that people from Latin cultures tend to use a medium to high level of gestures (Kaplan, 1967; Albert & Nelson, 1993 as cited in Eliot) and gestures occur more frequently in some cultures, for instance Hispanics (Macauley and Nakatani, 2006).

Cavicchio and Kita (2013) cite a study by Müller in which the gesture size of native Spanish and German speakers are compared, resulting in the Spanish speakers making more gestures in the space above their shoulders.[7]

Many studies have described Italian as a rich—or high—gesturing culture and/or language (Kendon, 1992; Barzini, 1964 as cited in Cavicchio). Cavicchio and Kita (2013), referencing Müller (1998), extended this richness in gesturing to other Mediterranean cultures and languages such as Spanish. In this line of reasoning, Cubans would also be a rich gesturing culture, since the only official and spoken language in Cuba is Spanish.

Countries and their cultures, a website devoted to the culture and history of numerous countries in the world, states that "the use of highly expressive hand gestures are distinctly Cuban".[8]

In summary, from the gathered information can be assumed that Cubans are high-gesturing people.

2.1.5 Gestures by Swedish people

There are not many studies on the number and types of hand gesture production of the Swedish people. Most studies are rather about their spoken and written communication (See Allwood´s publications)[9]. Also, studies have been done on how Swedes give and/or elicit feedback and/or co-activation, so these studies focus on specific gestures and not on how much Swedish people gesture in general.

However, a research about Swedish patterns of communication states that when comparing the gestures of Swedish people to those of Italians, "it seems clear that Swedish gestures normally have smaller size and lesser intensity" (Allwood, 1999). The author of the research adds that the impression he got from his data is that Swedes are people who do not use very big facial or other gestures.

In the same line, an article that appeared in the Swedish language magazine *Språktidnigen* quotes Tove Gerholm, a researcher at the School of Linguistics of the University of Stockholm, stating that when it comes to hand movements Swedes do it

---

[7] Müller´s study is in German, so I could not confirm Cavicchio and Kita´s asseverations.
[8] This quote is not backed academically, and it is used only to reinforce the previous information and as a way to make up for a lack of more relevant litterature on the topic.
[9] http://sskkii.gu.se/jens/publications/

in a discrete manner instead of more sweeping movements[10] (Swedenmark, 2012).

On top of all that, people from North Europe make less extensive use of gestures than people from the Mediterranean countries (Kendon, 1992).

Lastly, a website and company specialized in providing tips for successfully conducting business worldwide, states that "Swedes keep their body language and hand gestures to a minimum" (Executiveplanet.com).[11]

From the above mentioned, it can be assumed that Sweden is a low-gesturing society.

2.2 Co-activation

According to Allwood and Lu (2011) co-activation refers to the occurrence of similar vocal-verbal and gestural behaviors that occur in different communicators either sequentially or simultaneously, in order to serve the purpose to coordinate human communication. The authors express that co-activation can be vocal-verbal (words), and gestural (any kind of body movement, including gaze, facial expressions and posture, to mention a few), as well as a combination of vocal and gestures (such as laughter and giggles)—I interpreted they included vocal-gestural co-activation as a kind of gestural co-activation (they even mention giggling and chuckling when giving an example of a gestural reformulation).

Because the first two research question of my study is to find out the amount of hand gestures participants make, I also just focused on gestural co-activation, including vocal-gestural co-activation (laughter, giggles, chuckles…), since these actions are so closely related to gestures and because of what was mentioned in the above paragraph.

Allwood and Lu (2011) also refer that co-activation can happen in two ways. One is "repetition", when the element that is being co-activated is almost identical in expression and function to the one that brought it up. For instance, when A smiles and B smiles back. The other way of co-activation they mention is "reformulation". This happens when both elements—the original and the co-activating one—are similar in expression and in function. For example, A laughs and B smiles back. However, similarity in function is more important than in expression. In that case, when A shakes her/his head to express "no", B can reformulate this negation function with a hand movement.

In order to find answer to the third research question of my study, I spotted the instances in which gestural co-activation took place, and classified them as "repetition" or "reformulation". Then, I compared co-activation in the mono-cultural encounter to the one in the second encounter, to see if my assumption that the two Cuban subjects would co-activate each other more than the Cuban and the Swede was right or not.

2.3 Nonverbal Communication and Kinesics

[10] "Yviga handrörelse" in the original.
[11] Ídem as (8).

Kinesics is the study of nonverbal communication through facial expressions, body movements, body position and dress (De Vito, 2002; Gibson, 2010). Kinesics includes, then, the study of gestures, since gestures are a type of body movements.

2.4 Communication model

"Communication" is a concept that appears very often throughout this paper, so it is important to define it and relate it to the specific context of my study. A very short and general definition of communication is the:

"Transmission of content X from a sender Y to a recipient Z using an expression W and a medium Q in an environment E with a purpose/function F" (Allwood, 2002).

Since this definition is so broad and can be interpreted in different ways by different people, I will apply it to the specific case of my study[12]: the participants of my study act both as senders and recipients of content, while their gestures are a type of expression, the medium they use is the parts of the body involved in each gesture, the environment is the physical room in which the interactions takes place, and the purpose is to get to know each other.

2.5 Feedback

Feedback is one of the most important ways of giving support and signaling agreement (Allwood, 2001), and it is used as a "cooperative" way of exchanging information about the successfulness of communication. This information can be exchanged by means of verbal and vocal expressions and by means of gestures. (Allwood and Cerrato, 2003). According to Allwood and Cerrato (2003), an expression will be considered feedback when it occurs as a response to a previous communicative act (produced by an interlocutor), and serves one of the following functions: a) shows continuation of contact; b) shows perception; c) shows understanding; d) shows behavioral and attitudinal reactions.

2.6 Culture

There are a great many ways of defining the word "culture" (Gibson, 2010) and many of those definitions even conflict with each other (Hall, 2005). Gibson (2010) also shares three models that have been made in order to explain the concept of culture: the iceberg, in which the meanings, beliefs, attitudes and values of a group of people are hidden under the water; while other more "visible" aspects, such as clothing and food are on the little tip that is above the water. The onion model is a metaphor for culture being divided into layers. On the outer layers can be found the "visible" aspects, while close to the core of the onion are the same underlying and hidden dimensions that were "under the water" in the previous model. The third model represents a tree in which the visible aspects are on the branches and leaves, the hidden ones on the trunk and, holding the tree up, are cultural roots.

[12] This is my own interpretation of Allwood´s model. For more information, see Allwood, 2002).

The term “culture” refers to all the characteristics common to a particular group of people that are learned and not given by nature. That the members of a group have two legs is thus not a cultural characteristic but a natural one, while a special but common way of walking would probably be cultural. (Allwood, 1985).

2.6.1 National Culture

Although culture has been defined in hundreds of ways over the years (Hall, 2005), and in none of the cases consulted reference is made to nationality (when defining culture), almost any time authors try to exemplify culture, they talk about the nationality of the involved people or groups. Piller (2011) is one of the ones that gives different examples instances of intercultural communication and states that in all of them “the scope of each underlying understanding of culture (…) is a nation in each example”.

Allwood (1985) confirms Piller´s asseveration when stating that “in the context of intercultural communication, the groups are often associated with national states, and we may speak about Swedish culture, French culture, etc.” Levine et al. (2007) also express that “treating nations as culture can be meaningfully equated for the purpose of a specific research project”. For all the above mentioned, in this study, I will refer to culture in the sense of national culture.

It is often the case that people in one nation often have a unifying national identity, language, and the same political, legal, economic, and educational systems (Levine et al., 2007). This certainly is the case of Cuba, since Cuban society is quite homogenous in all the above-mentioned aspects. During the shaping of the Cuban society, many cultures met and transformed one another. Cuban culture is the creative intermingling of indigenous Spanish, African and Asian cultures, each newly arriving group contributing something to the stew whose ingredients are enriched by the presence of all the others (Bernal, 2005). Nowadays, and for many years already, there is almost no immigration to Cuba, so it can be said that the Cuban society and culture have not been affected by external forces in the last years.

On the other hand, some nations can have multiple cultures and be comprised of peoples with many different cultural groups (Levine et al., 2007). This is the case of Sweden, where there is active immigration and national subgroups that not always acculturate to the native norms. However, Sweden has a relatively long political centralized government and geographic isolation, so it should be possible to find common patterns at least for certain groups and regions (Allwood, 1990). On top of that, the Swedish participant is of ethnic Swedish origin, so it can be safe to say that her communication patterns should similar to those of most Swedish nationals.

Although treating nations as cultures can be either extremely useful or highly misleading (Levine et al., 2007), in the specific case of the present study, culture can, as supported with the above facts, be equated to national culture.

2.6.2 High-context Culture vs Low-context Culture

Context is the information surrounding an event, and without it the event cannot acquire meaning. In order to create meaning, both the event and its context combine.

However, the extent to which each of them influences the making of the meaning is tightly related to the culture of the people involved. In high-context cultures, people have extensive networks among family, friends, co-workers etc., so they do not need very detailed background information for daily transactions. On the contrary, low-context cultures—Scandinavians included—compartmentalize all aspects of their lives and need, therefore, in-depth background information in their interactions (Hall and Reed, 1990). Latin Americans belong to a low-context culture (Kavakli and Nasser, 2012).

2.6.3 Polychronic Cultures vs Monochronic Cultures

Although this taxonomy has to do mainly with people´s view on time, many other factors haven used when describing both types of cultures. For instance, how people approach work, personal relationships, and commitments, just to mention a few (see Hall and Reed, 1990, p. 15).

However, in this study I will focus on an aspect that has to do closer to communication and which will be mentioned later on in the Conclusions: mono-chronic cultures pay attention to and do only one thing at a time while polychronic cultures can and do many things simultaneously. Scandinavians belong to a mono-chronic culture while Latin Americans belong to a polychronic one (Hall and Reed, 1990).

2.7 Intercultural vs Cross-cultural Communication

As it has been mentioned before, the focus of this paper is the study of nonverbal communication in interpersonal communication, both in a mono-cultural setting and a setting where two people from different nations and cultures meet.

Cross-cultural communication research involves comparing and contrasting the communication patterns of people from one culture with those of people from another culture, whereas intercultural communication has to do with researching how people from different cultures interact with each other (Levine et al., 2007). This means that a cross-cultural research would be a comparison of the results of two or more mono-cultural studies. For instance, a researcher would analyze how Swedish people greet each other in general, and compare these results to how Cuban people great each other. So, in cross-cultural researches, people from different cultures do not interact with each other. On the other hand, intercultural communication takes place when the interlocutors are from different cultures (Gibson, 2010; Levine et al., 2007).
A more specific definition of intercultural communication is that it "is more likely to be seen in studies of communication in which culture, and particularly cultural differences, is made relevant by and to the participants" (Piller, 2011).

Consequently, the present paper is not a cross-cultural study, rather a study on mono-cultural and intercultural interactions.

3 Methodology

The data was collected through two audio-video films with a total of three participants—two Cuban women and a Swedish woman. The videos were manually

coded using the video annotating tool ANVIL (Klipp, 2001). According to Allwood (2008), audio-video recordings with annotations are often used to describe gestures, while transcriptions are usually used when analyzing what is said in the videos. Since my study focuses on gestures (number of hand gestures and body movement mirroring/co-activation), I did not transcribe the videos. I annotated all hand gestures produced by the participants in order to give answer to my first and second research questions. For answering the third research question, regarding co-activation, I focused not only on hand gestures, but actually on all types of body movements, such changes regarding body posture and orientation, head movements, leg movements and smiles/laughter. These were also annotated when considered to be part of co-activation.

3.1 The recordings

Both recordings took place on the 12th of April 2013 at the IT Faculty of the Gothenburg University, on the Lindholmen campus. The equipment used was a Panasonic camera (Model HC-V707M, 50 fps for frame by frame analysis) on a tripod, located about 2-3 meters from the participants.

In the days prior to the recordings, the participants had no knowledge of what the purpose of my study was. This decision was made so that the participants were not self-conscious about their communications styles when interacting with each other. The participants did not know each other and did not know either each other´s nationalities. The thought behind this was the fact that I wanted to see, in the case of the mono-cultural interaction; if there would be any differences in the communication of the participants before they found out they came from the same country and after. Another reason for participants not knowing each other´s nationality was in order not to influence on the language they should use with each other. However, an unexpected situation happened in the mono-cultural interaction—participants did not realize they both came from the same country. Another issue was that, as said before, I did not want to let the participants know where they came from and what languages they spoke before hand, since I wanted them to find this out on camera. However, when I informed them that they could start interacting with each other, I spoke in Swedish, so they realized that this was a language that they both understood and, therefore, engaged in conversation in Swedish.

Just minutes before the recording, I informed each participant separately that the purpose of my study was to study communication on first time encounters (without mentioning anything about gestures). I explained to them that they would enter a room, and they should not talk to each other before I told them so (so that all interaction was captured on camera). The first recording was the mono-cultural one, and it took 8 minutes. However, once I told the participants they could stop interacting, I told them they both were Cubans and they started to talk very animatedly off camera, but the audio was still captured.

3.2 The participants

Three women were selected for this study—two Cubans and a Swede. All women are around forty years old, and are all fluent in both Spanish and Swedish.

a) Cuban woman 1 (C1) has been living in Sweden for 16 years. She is 42 years old and is married to a Swedish man, with whom she has two daughters (8 and 4 years respectively) She has degrees in dance and theatre, therapy, personal couching etc. She comes from The West part of Cuba. At present, she is study Marketing Events.[13]

b) Cuban woman 2 (C2) is 38 years old and has been living in Sweden for 7 years. She has a University degree in Spanish Philology and is a certified teacher for primary and High school. She lives with her *sambo,* from Cape Verde, and they have a 1-year-old son together. In Cuba she used to work at a linguistics research institute. Nowadays she works fulltime as a Spanish teach in primary schools. She comes originally from the central part of Cuba, but she did her University studies and working life in the East.

c) The Swedish woman (S1) is from the North of Sweden, but has been living in Gothenburg for over 20 years now. She is a certified Swedish and English teacher for primary schools and High school. She was *sambo*[14] with a man from Nicaragua and together they have an 11-year-old daughter. She used to live in Nicaragua during 18 months and still visits on a regular basis. She works as a Spanish teacher in primary schools in Gothenburg. She is 43 years old.

With that being said, all women have similar educational (University degrees) and linguistic backgrounds (fluent in Spanish and Swedish). Since both Cuban women have been living in Sweden for a considerable amount of time, I thought it would be advisable to select a Swedish woman who had also lived in Cuba (ideally) or, at least, any other Latin-American country. If I had selected a Cuban woman living in Sweden and a Swedish women with no interaction whatsoever with the Spanish language or Latin American culture and way of living, then the results would probably have been more biased (it could have been argued that the Cuban woman might have influence from the Swedish language and culture in her communication patterns, while the Swedish woman would have a more "pure" communication style).

3.3 Gesture Recognition

Several studies have been made in order to facilitate the task of recognizing a gesture from beginning to end. Automatic gesture recognition has been actively investigated in the computer vision and pattern recognition community (Wang *et al*., 2006) and are technologically driven (Kavakli and Naser, 2012). So, these studies belong mostly to the fields of computer science and language technology, and are based on mathematical algorithms and calculations.

3.4 Coding

As mentioned in the section above, most existing models to recognize gestures are developed and used in the technology field. However, the task of automatic gesture segmentation is highly challenging due to the computational burden, the presence of

[13] It might be relevant for the study to mention that in both interactions, C1 did most of the talking.
[14] A Swedish word meaning a life partner with whom one lives but is not married to.

unpredictable body motion and ambiguous non-gesture hand motion (Tsai, 2012). That is why I did my annotations based on my own observation of the videos. In order to recognize, measure and analyze gestures manually, I consulted different models and sources[15], and decided to add three parameters (repetitive, mixed and complex gestures) to the ones existing in ANVIL, since they did not seem sufficient for describing the gestures my participants were making. "Existing implementations of gestures used in real communicative gestures are (…) often based on observation that we might describe intuitional" (Cerrato and Skhiri, 2003) and, when annotating hand gestures, the annotator should be the one to identify and establish where each gesture starts and ends (Allwood *et al*. (2005). This means that a lot of freedom—and responsibility—is put in the hands of the annotator.

It also is important to take into account that "the production of an accurate model of gesture realization is a time-consuming process, which requires extensive and detailed analysis of the gestures used in real communicative situation by human beings" (Cerrato and Skhiri, 2003). With that being said, there might be "errors" in the annotations, or another coder may annotate the same videos in a different way, since the process is rather subjective and intuitive.

Since I did not find in the literature any model that helped me recognize and measure gestures manually, I developed my own set of parameters:

a) I started measuring a gesture interval from the moment the body part involved left its initial position (rest position, according to Kendon, 1990) until it went back to that original position or took a new rest position. For instance, if a participant had her arms crossed, and suddenly raised them both and brought them back again to crossing mode that was considered a gesture. If the participant had her arms crossed and suddenly raised them and then brought them down to both sides of her body, and left them there, then I considered the gesture from the moment when she raised her arms till the moment they went to the final position (along the body).

b) If one same type of movement occurred repeatedly when the body part going back to its initial rest position and staying there for half a second or less during the process, I considered it a single gesture (gesture sequence) and labeled it "repetitive gesture". For instance, if a person had her both hands together in front of herself, and opened them and closed them back to the initial position, only to open them back again, I still counted the whole action as one single gesture, and specified that the gesture is repetitive. If the arms or hands go back to the rest position and remain there for more than half a second, then I considered the movements after that second as another gesture. This part was tricky, since at times, it was obvious that, although the hands/arms were in the rest position for longer than a second, the speaker still had intention of continuing the movement. However, taking into account the fact that "human gestures happen in time"[16] and "it is important to consider the temporal characteristic of gestures" (Tsai, 2012) plus the fact that I am studying number of gestures and not gesture intention, I decided to make this classification. Moreover, phrases of action recognized as 'gesture' move away from a 'rest

[15] such as the MUMIN multimodal coding scheme. However, this scheme is mainly for feedback, turn-management and sequencing.

[16] http://www.maxwell.lambda.ele.puc-rio.br/12443/12443_4.PDF

position' and always return to a rest position (Schegloff, 1984 as cited in Kendon, 1990), and the described case, there is a clear initial and final rest position. Equally, in the case that the pause between two similar gesture intervals was shorter than a second, I still counted it as one single repetitive gesture, even if it was obvious that pause between both intervals was "definite". In this case, another coder could have annotated every single gesture interval as an independent gesture. So, it should be taken into account that, when stated "repetitive gesture" there are several gesture intervals and, therefore, depending on the coder, the number of gestures annotated by me could be even larger if annotated by another person. If a gesture was done repeatedly, but without passing through the resting position, then it was just a "repeated gesture", which is one of the classifications in the video annotation tool ANVIL (Klipp, 2001).

c) However, if two different gestures, each having its own initial and final resting position, happen one after another, even with less than half a second in between, I will consider them two independent gestures.

d) If a completely different gesture with a clear starting and finishing resting position occurs within a repetitive one, I considered them as two gestures. For instance, if a person is opening and closing her hands (as described in b) and right after she closes her hands (rest position) uses one single hand to point somewhere, only to continue opening and closing her hands, I considered the opening and closing of hands as one "repetitive interrupted gesture", and the pointing movement as another gesture.

e) If one gesture sequence (with only one initial and one final resting position) consisting of different gestures intervals involving the same body part occurred within one short time span, I considered it one single gesture and labeled it "complex". This for the case in which, for instance, a speaker makes all kinds of apparently random movements with her hands (or arms) without passing through a resting position.

f) If a gesture involved more than one body part (for instance arms and head, or change of torso position) with the intention of expressing meaning, I considered it one same gesture, and labeled it "mixed". For instance, there is a case in which C1 starts moving her hands and then turns her whole body towards the left and extends both arms upwards, while stretching one her legs backwards. All these body part (hands, arms, torso, leg) are elements of the same complex gesture.

g) In the same case, if a person was doing a repetitive gesture and interrupted it momentarily for doing some self-grooming action, and then continued to engage in the previous gesture, I still considered it one repetitive gesture (and specified interrupted, as in "d").

4 Ethical Considerations

For this study, I followed the regulations stated by the Regional Ethical Review Board regarding personal information about research participants. Some of the regulations

are that the participant be informed before hand about the purpose of the research, that they be explained to that their personal information will be kept confidential, and not included in the paper. If pictures of the participants are needed (in order to illustrate a movement or situation), this will only be done with the participants´ consent. The participants also had the right to retire from the study at any time. The videos and the participants personal and contact information will be saved and secured at the Department of Applied of IT of the Gothenburg University, following their safety routines. Finally, participants signed a consent form were they confirmed that they had been informed about the purpose of the thesis as well as their consent for participating in the study.

5 Reliability of Annotations

The author of this paper annotated both videos, following the scheme described in the Methodology, and these annotations were checked by a PhD student at the Department of Applied IT who specializes in gesture coding. Normally, reliability tests are done by checking a small excerpt of the whole video. However, for this study, the other coder checked the whole videos. In the mono-cultural video she found 30 hand gestures for C2 and 61 for C1 as opposed to 30 and 62 respectively annotated by me. In the intercultural interaction, I annotated 10 hand gestures for S1 and 108 for C1, while the PhD student coded 9 and 104, respectively.

6 Findings and Analysis

In the following chapter I will present my findings on the hand gesture production and co-activations in both videos, as well as compare C1 and C2 in their hand gestures, and both of them with S1.

6.1 Hand Gestures

In the intercultural interaction 10 hand gestures were annotated for S1 whereas 108 were annotated for C1 during a period of approximately 10 minutes (the time for both videos was counted from the moment the first annotated gesture started till the moment the last annotated gesture ended). This means that S1 did an average of 1 hand gesture per minute while C1 did 10,4.

In the mono-cultural interaction 30 hand gestures were annotate for C2 and 62 for C1 in a span of approximately 7 minutes. This means C2 did an average of 4,3 gestures per minute, while C1 did 8,9.

6.1.1 Gesture Specificities

Below, I give a detailed description of the number of hand gestures each participant produced, as well as a description of the distribution of these gestures following some of the classifications that appear in ANVIL (Klipp, 2001) and also following some of my own parameters (mixed, complex and repetitive). The ANVIL classifications that I took into account for analyzing the gestures are: single-handed or both-handed, central or peripheral (this means if the trajectory of the movement happens within the area corresponding the gesturer´s torso or if it occupies a larger area); and single-movement or repeated). I chose to focus on these categories because the others were

too specific of the hand´s position and not relevant for my study, such as if the palms were open or closed and if the fingers were extended or not. Moreover, it was not very clear all the time to see the position of the hand and fingers, so that would add more error margins to my results.

S1: 8 single-hand gestures and 1 using both hands; 8 central gestures and only one peripheral; 2 were single movements against 7 repeated; 9 mixed gestures; 2 complex, 3 repetitive ones.

C2: 30 hand-gestures in total. 24 single-hand gestures and 6 using both hands; 27 center gestures and only 3 peripheral; 24 single movements and 6 repeated movements. 7 mixed gestures, 3 complex and 1 repetitive. Most of the time was moving her legs (swinging them or moving from right to left.)

C1 (when interacting with C2): 62 hand gestures, 12 of which were single-handed (50 with both hands). 16 gestures were peripheral (which means that the movement of the arms was outside the area corresponding the torso) and consequently 46 gestures were central. 26 were repeated and 36 were single (regarding the repetition of the movement). According to my own classification 6 gestures were mixed, 14 were complex and 8 were repetitive.

C1 (when interacting with S1): 108 hand-gestures, only 15 of which were single-handed, 30 peripheral, 49 were repeated (59 single). 34 gestures were mixed, 23 were complex and 13 were repetitive.

	Single hand	Both hands	Central	Peripheral	Single movement	Repeated movement	Mixed	Complex	Repetitive
S1	8	1	8	1	2	7	9	2	3
C1 (S1)	15	93	78	30	59	49	34	23	13
C2	24	6	27	3	24	6	7	3	1
C1 (C2)	12	50	46	16	36	26	6	14	8

Table. 1: Gesture distribution and type per participant. C1(*) = C1 when interacting with (*).

6.1.1.1 Similarities between C1 and C2

Some similarities between the two Cuban subjects are the fact that they both made more central gestures than peripheral, and also they both did more single-movement gestures than repeated ones. On top of that, they did a similar number of mixed gestures when talking to each other.

Although not annotated, but obvious to the viewer, these two subjects also moved their legs much more than S1 and even took little steps around the floor, unlike S1. Actually, some of the mixed gestures of the Cuban participants included the legs, which did not happen with S1.

Probably the most remarkable similarity in the gestures of C1 and C2 (especially in regards to S1) is that, as it can be seen in Table 1, both of them produced a considerable larger number of hand gestures than S1.

6.1.1.2 Differences between C1 and C2

However, some differences in the gesture production of C1 and C2 occurred also. For instance, while most of C2´s hand gestures were single-handed, C1 used both hands in most of her gestures. C2 also did a considerably less amount of peripheral gestures in comparison to C1. When it comes to the repetition of the hand movements, C1 did in both of her interactions 10 single-movement gestures more than repeated ones (approximately 55% of all of her hand gestures when talking to S1 and 58% when talking to C2), while C2 did 4 times more single movement gestures than repeated ones (80% of all of her hand gestures).

Fig. 1: C2 doing a single-handed gesture and C1 doing a both-handed one.

6.1.1.3 Similarities between S1 and C1/C2

One similarity between S1 and C1/C2 is that they all did more central gestures than peripheral

6.1.1.4 Differences between S1 and C1/C2

The main difference between S1 and the two Cuban subjects is the considerably smaller number of hand gestures she produced with respect to the Cuban subjects. Also, most of her gestures involved repeated movements, which did not happen in the case of her Cuban counterparts, who made mostly single-movement gestures. Another difference is that S1 only did 1 peripheral gesture, which I suspect was as co-activation of C1 (it means that she was mirroring C1). Something else that should be pointed out is that the totality of S1´s hand gestures were combined with other parts of the body (classified as mixed), such as the head in all cases and torso in some. On the other hand, her legs were never involved while producing hand gestures. As a matter of fact, she was the one who moved her legs the least out of the three participants.

6.2 Co-Activation

There were a total of 35 gestural co-activations, 14 of which were reformulations. When it comes to co-activation, in the mono-cultural interaction, 15 instances of co-activation were noted—5 reformulations and 10 repetitions. C1 did in total 7 co-activations, 5 of which were repetitions and 2 one was a reformulation. 21 instances of co-activation were noted in the intercultural interaction—9 of which were

reformulations. In this interaction C1 co-activated 10 times, 3 of which were reformulations.

Participant	Mon. Interaction	Int. Interaction	Total
C1	7 (2)	10 (3)	17 (5)
C2	8 (3)	-	8 (3)
S1	-	11 (6)	10 (3)

Table. 2: Total number of gestural co-activations. Number of Reformulations in parenthesis. (Mon. = mono-cultural; Int. = Intercultural.)

If we calculate the approximate average of co-activations per minute, we get that in the mono-cultural interaction, 2,14 co-activations occurred per minute, while in the intercultural interaction it was 2,1 the number of co-activations per minute; almost an identical amount. If we focus on C1´s co-activation behavior in both interactions, it turns out she engaged in an average of 1 co-activation per minute when talking to S1, whereas while talking to C2 she co-activated the same average of 1 time per minute. Taking these figures into consideration, C1 behavior seems to have been almost identical when it comes to the average of her co-activations.

When it comes to the body parts involved, 9 co-activations involved head movements; 14 involved face (smiles, laughter and chuckles); 7 included arms/hands; and 6 were concerned with body movements (change in posture, movement of legs and shrug).

Body part	C1 (C2)	C2	C1 (S1)	S1	Total
Head	6	2	0	1	9
Face	0	1	4	9	14
Arm	1	4	2	0	7
Body	3	1	1	1	6

Table 3: Body parts involved in the gestural co-activations, per participant and in total. C1(*) = C1 when interacting with (*).

When it comes to the body parts involved in the co-activations, a 38,9% of co-activations involved the face (smiles, laughter and chuckles); followed by 25% of head movements; then 19,4% involved arms; and finally, 16,7% included some type of body movement.

In order to find out if C1´s communicative pattern was more similar to C2 than to S1, I calculated the percentage of body part that each participant used in her individual interactions. As it can be seen in Table 3, C1 and C2 did not have a similar behavior in the body parts involved in their co-activations. And, although they did have a similar number of total co-activations (7 for C2 and 8 for C1), so did C1 and S1 (11 against 10). See table 2.

Participant	Head (%)	Face (%)	Arm (%)	Body (%)
C2	25	12,5	50	12,5
C1 (C2)	60	0	10	30
S1	9	81,8	0	9
C1 (S1)	0	57,1	28,6	14,3

Table 4: Percentage of body parts used in co-activation by each participant used in their individual interactions.

As it can be seen in Table 2, C1 had a similar number of co-activations than C2 and S1 when interacting with each of them respectively. However, Table 3 and 4 show that the distribution of these co-activations were not equal when it comes to the body part involved, which means that C1´s co-activating behavior was not especially closer to C2 than to S1.

However, it is relevant to note that, although not coded, due to its permanent attribute, both Cuban participants seemed to have similar body posture while talking to each other—hands at the level of their respective stomachs (as the most usual resting position) and the weight of the body falling on one extended leg, while the other leg was bended at the knee (See Fig.2). In contrast, in the intercultural interaction, participants adopted different body postures. S1 stood most of the time either with her hands in her pockets or with her arms crossed over her chest, while C1 kept her hands over her stomach (as when talking to C2) and a few times also alongside her body.

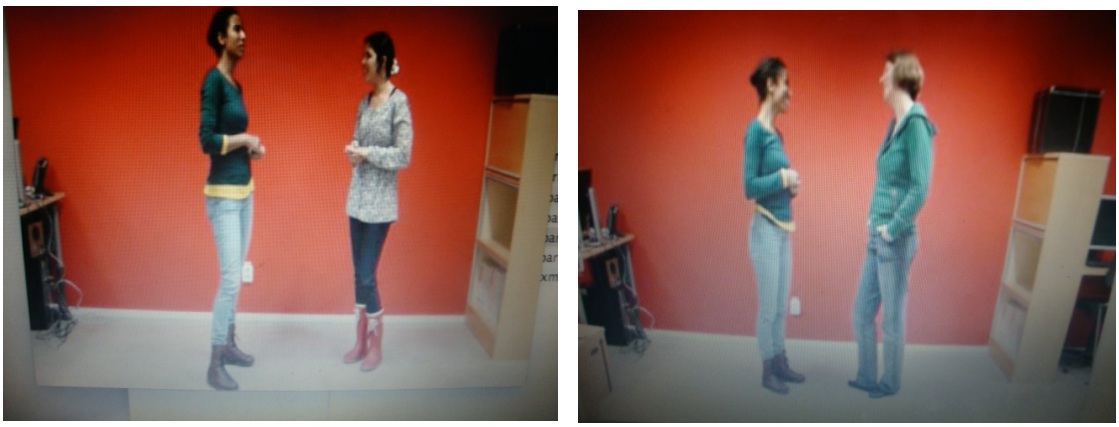

Fig. 2: Examples of body posture of the participants during the interactions. C1 and C2 have more similar posture.

Something else that should be mentioned is the fact that at some point in the conversation (min. 06:07 approx.), S1 did a gesture that resembled in its stroke some of the gestures C1 had been doing. However, I did not classify as a co-activation, since there was not a clear immediate similar gesture produced by C1 before.

7 Discussion and Conclusions

In this chapter I will summarize my findings and relate them to the existing theories and literature.

When it comes to the number of hand gestures produced by the participants of this study, there is a great difference between the Cuban subjects and the Swedish one—the Cuban participants produced many more hand gestures than the Swedish one, which is in line with the literature, that states that Latin Americans tend to use medium to high level of gestures (Kaplan, 1967; Albert & Nelson, 1993) and that gestures occur more frequently in some "cultures" such as Latin America (Macauley and Nakatani, 2006), whereas Swedes keep their hand gestures to a minimum (Executiveplanet.com).

A study by Kavakli and Nesser (2012) shows that when compared to Anglo-Celtic subjects, Latin Americans made a lower number of hand gestures. However, Latin American did a larger number of gestures per second, which means that they were studied during a shorter period time than their Anglo-Celtic counterparts. So, if they had gestured or been videoed during the same time span as the Anglo-Celtics, they would have probably produced a larger amount of hand gestures than their counterparts. Although I cannot equal Scandinavians to Anglo-Celtics, still the Cuban participants of my study (who classify as Latin Americans) also did a larger number of gestures per second than the Swede subject.

Using the theory to attempt to explain why the Cubans subjects made more hand-gestures than the Swedish one, we find that Scandinavians, belonging to a mono-chronic culture, normally do one thing at a time. Since gestures are most often accompanied by speech (Cerrato and Skhiri, 2003), it can be speculated that the Swedish subject did not feel comfortable with talking and gesturing at the same time. The Cubans, on the other hand, being polychromic, felt at ease doing two things at the same time—talking and gesturing.

Another way of relating the theory to this point is that Cubans belong to High-context cultures, in which much of the meaning is conveyed by nonverbal means, including gestures (LeBaron, 2003)[17]. Swedes, on the contrary, belong to a Low-context culture and, therefore, rely more on words to make themselves understood.

Another finding was that, while both of the Cuban participants did several peripheral movements—which means that the amplitude of their arms and the movements in general (while producing these peripheral gestures) were "big"—, almost all of the gestures produced by the Swedish subject were central, which means they were relatively small movements or had a limited physical scope. This corresponds to the literature on the field, which states that Swedish gestures normally have small(er) size (Allwood, 1999) and that Swedish people´s hand movements are discreet as opposed to sweeping (Swedenmark, 2012). This finding is also in concordance with Cavicchio and Kita (2013) that cite a study by Müller in which native Spanish speakers make bigger movements (above the space of the shoulders) than native German speakers. Once again, it is not my intention to compare Swedes to Germans, but in this case we cannot forget the relation of Swedish language to German, and the fact that the Swedish speaker of my study also did smaller hand gestures than the native Spanish speakers.

Another difference in the hand gesture production of the Swedish subject with respect to the Cuban ones is the fact that the 100% of the hand gestures produced by the Swedish participant were combined with movement of another part of the body; in her case always the head and sometimes also the torso. In contrast, only 23,3% of C2´s hand gestures were mixed and for C2 it was 31% when interacting with S1 and only 9,7% when interacting with C2. I mentioned before that Swedes are not likely to doing more than one thing at the time, due to them belonging to a monochromic culture. However, in this case, although the Swedish subject was moving both her arms and another part of her body, these can still be considered as doing one thing—

[17] Here I would like to comment that just by being a High-context culture does not automatically means that the culture is rich in gesturing, since, for example Japan is a High-context culture (Gibson, 2010) but gestures do not occur often there (Macauley and Nakatani, 2006).

gesturing. The fact that the head was involved in all of her hand gestures can, to some extent, be related to the fact that the most common gestural feedback giving expressions in Sweden is nods and shakes of the head[18] (Allwood, 1999). Since the Cuban subject was the one doing most of the talking, it is probable that the Swedish subject was engaging in more feedback and, therefore, moving her head more. So, it might not be so surprising that the head was involved also when gesturing with the hands.

Regarding the gestural co-activation, 15 repetitions and 5 reformulations occurred in the mono-cultural interaction—which means only 33,3% of all gestural co-activation were reformulations. In the intercultural interaction, on the other hand, there were 21 gestural co-activations, 9 out of which were reformulations. This means that 42,8% of all gestural co-activations were reformulations in this interaction. In a similar study, Allwood and Lu (2011) studied the co-activation patterns between Chinese-Chinese subjects and between Chinese-Swedish subjects. Their result was that in the mono-cultural interactions, 55,6% of gestural co-activations were reformulations while the percentage in the intercultural interactions was 66,7%. Although the percentages of Allwood and Lu (2011)´s were higher than mine, in both studies the intercultural reformulations were approximately 10% higher than the mono-cultural ones.

Allwood and Lu (2011) also studied the co-activation patterns of a Chinese participant that interacted both with other Chinese people and with Swedes. The results for this Chinese participant were that she did 45,2% of gestural reformulations in the mono-cultural dialogues and 44,1% in the multicultural ones. In my study, there is also a participant (C1) who was filmed interacting with a country mate and with a Swede. In the mono-cultural interaction, C1 did a 28,6% of reformulations and 30% in the intercultural interaction[19]. As it can be noticed, in both studies, the participants that were being analyzed performed approximately the same amount of reformulations in their mono-cultural interactions as in their intercultural ones[20], with a small difference in the fact that C1 did a higher percentage of reformulations in her intercultural interaction than in their mono-cultural one, while the Chinese subject did a little higher percentage of reformulation in her mono-cultural interaction than in the intercultural. As Allwood and Lu (2011) recognize these differences in the percentage between the mono-cultural and the intercultural interactions are "too small to be significant". However, what can be significant is the fact that both participants (C1 and the Chinese subject of Allwood and Lu´s study) performed approximately the same percentage of reformulations in their mono-cultural interactions as in their intercultural ones.

As mentioned before, Allwood and Lu (2011) claim that people with similar cultural/ethnic/linguistic backgrounds tend to co-activate each other more during interactions. However, in the present study, C1 showed almost identical number of co- activations as her interlocutors when interacting with each of them (See table 2). So,

---

[18] Other parts of the body that are usually involved in feedback are smiles, raised or frowning eyebrows and shoulder shrugs (Boholm and Lindblad, 2011).

[19] The Chinese subject did 31 repetitions and 14 reformulations in her mono-cultural gestural co-activations and 34 repititons and 15 reformulations in the intercultural ones.

[20] I did not pay attention to the speech of my partitipants, so it is possible that some of the data I claim to be "gestural co-activation" classifies as "gestural + vocal-verbal". However, if we consider also Allwood and Lu (2011)´s gestural + vocal-verbal co-activations, then the Chinese participant would have made 50% of reformulations in her mono-cultural interactions and 47% in her intecultural, so my analysis is still valid.

in this case, the similarity in cultural and ethnical background that C1 and C2 shared did not seem to be so relevant. This makes me wonder if the claim of Allwood and Lu applies only (or mostly) when participants are aware of the similarity of their backgrounds. However, it is relevant to add that Allwood and Lu (2011) also stated that the co-activation between people with similar backgrounds is more likely to be in the form of repetition. And both Cuban subjects performed more repetitions than reformulations when talking to each other, while the Swedish subject performed mostly reformulations. In this specific matter, Allwood and Lu (2011)´s statement was confirmed in my study.

As mentioned before, the Cuban subjects did not know they had cultural and academic background similarities before and/or during their on-camera interaction. I will now present some facts that make me think that not being aware of their background similarities made C1 and C2 behave differently with each other than if they had known they were actually country mates.

I begin by saying that although their dialogue was rich in hand gestures and utterances—and more similar in the number of hand gestures produced by each in comparison to in the intercultural interaction—, once they found out they were country-mates, their behavior changed completely. They started smiling, laughing, talking to one another effusively and even kissed each other and exchanged phone numbers. According to Olguin (1995)—as cited in Elliott (1999) Latin people tend to behave in a somewhat low-key, quiet and respectful manner when interacting in public ethnically mixed settings, as opposed to a higher level of emotional expression in settings with only Latin people present. And this is exactly what happened in the case of the Cuban subjects—they appeared quite respectful and calm when talking to each other unaware of their cultural origin, and more happy and effusive after this information was known.

Another example that reinforces my question about whether or not being aware of background similarities influences the way in which people communicate to each other, is the fact that conversations among Latin Americans may take place at a much closer physical distance than in other countries. (Macauley and Nakatani, 2006) And more specifically, South American and Spanish females need a closer distance (maybe no more than 15 inches, or 38,1 cm) to communicate and they touch quite frequently in the arms, hands, shoulders without feeling "invaded" or "too familiar" (Gómez, 2009). However, in the mono-cultural interaction of my study, the distance between interlocutors was visibly wider than the one in the intercultural interaction, which could mean that the interlocutors were behaving as if the other was not Latin American.

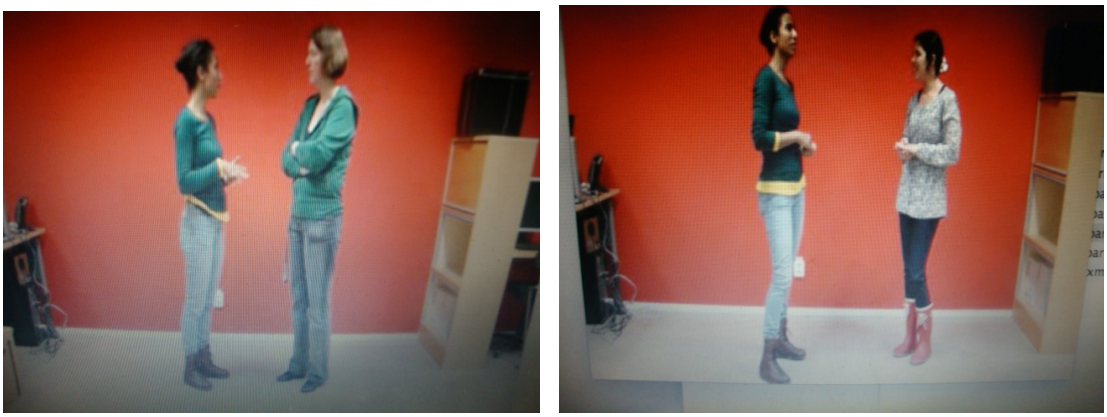

Fig. 3: Distance between C1/S1 and C1/C2

Finally, to answer my first research question, both Cuban participants did more hand gestures than the Swedish participant. They both did a similar number of mixed hand gestures when talking to each other and they both did more central than peripheral hand gestures.

Regarding the second question, although all participants did more central hand gestures than peripheral, the Swede only did one peripheral gesture, whereas the Cubans did between 3 and 30 each. Another difference is the fact that all but two of the hand gestures produced by the Swedish subject were repeated, while the Cubans subjects did more single movement gestures than repeated ones. Another difference in their communication patterns is the fact that none of the mixed movements produced by the Swedish participant included the legs, while this did happen with the mixed hand gestures of the Cuban participants.

To answer the third research question, there were 35 co-activations annotated in total, out of which 11 were reformulations and the rest repetitions. The number of co-activation was almost identical for both interlocutors in each interaction (C1 did 7 when interacting with C2, who did 8; and C1 did 10 when interacting with S1, who did 11). So, the number of co-activation produced by the participants of the mono-cultural interaction was not closer than the number of co-activations between the Cuban and the Swede. However, a fact that may hint that the Cubans co-activated each other in a more similar manner, is that most of their co-activations were repetitions, whereas more than half of the co-activations of S1 were reformulations.

And, as for the last research question, when it comes to hand gesture production, the gap in number of the hand gestures produced between C1 and S1 (108 against 10) was a lot larger than the gap between C1 and C2 (62 against 30). So, it can be said that, regarding this specific aspect, C1 was definitely not accommodating to S1 (neither was S1 accommodating to C1) and the differences in their communication pattern were rather magnified instead. When it comes to the mono-cultural interactions, although it cannot be said that C1 was "definitely" accommodating to C2 (or vice versa), at least they did not seem to magnify their differences either. In this point I would said they were neither accommodating nor magnifying.

8 Recommendations for Future Studies

Future studies can include to film Cuban participants who live in Cuba and who have had little or not contact with foreign cultures, in order to then compare their gesture production and co-activation with the ones obtained in the present study. Another study inspired by this one could be to film two people from the same culture without informing them they are country mates, and then at some point in the conversation, inform them that they are from the same country (if they do not figure it out by themselves). It would be very interesting to compare how these two individuals were interacting before and after knowing their respective geographical/cultural origin. From this context we could find out if the statement that people who have similar cultural/ethnical background tend to imitate each other more occurs in any type of context, or only (more) when participants are aware of their background similarities.

Many other studies can be made from the data collected in my study—the function of the gestures, the topic of conversations, the most repeated gestures and/or words, how feedback and turn management took place. It could also be interesting to film the Cuban subjects (or two other Cuban subjects) speaking in Spanish, and find out similarities and differences in their gesture production, to find out to which extent the Swedish language influenced their gesturing during the present study.

9 Limitations of Study

Ideally, the Cuban patterns for hand gesture production should be recorded in Cuba, with Cuban participants that have none or little interaction with other cultures (in order to try to keep the authenticity of their communication patterns). The same applies for the communication patterns of the Swedish participants. It should ideally be people who do not have daily close interactions with other cultures and languages. However, the Cuban participants available live in Sweden and are, therefore, immersed to some extent in the Swedish culture. That is why, in order to maintain a similarity in the participants´ background, I chose to film Swedish participants with knowledge of the Latin American culture and Spanish language.

The results of a study about cultural differences in conversational gestures, indicates that native Japanese speakers use a greater number of spontaneous gestures when speaking English than when speaking Japanese (Macauley and Nakatani, 2006). This means that, since languages differ in the way they express things, where and how a speaker deploys gesture may differ accordingly (Kendon). In other words—language differences might certainly be related to kinesic differences (Birdwhistell,1970 as cited in Kendon 1990).

This means that the Cuban participants would probably have communicated in a different way had they been speaking Spanish. It could also mean that the gestures they made were conditioned by the Swedish culture. Two quotes confirming my assumption are “the individual may adapt to the gesture usage of the new culture when the person is exposed to that language and culture over a period of time” (Macauley and Nakatani, 2006) and “when speaking in a particular language, the speaker might display the gesture pattern found in the corresponding culture” (Kavakli and Nasser, 2012).

The fact that there are only three participants should not be a big problem since analysis of multimodal data is often very time-consuming and therefore costly, which results often in case studies. (Alwood, 2008). However, due to the small scale of the study (only three participants and two videos), the results of this study can only be interpreted as a description of what happens in the videos and more extensive research should be done in order to get to generalizations. In this sense, this paper contributes towards this type of future research.

10 Bibliography

Allwood, J. (1985). Intercultural Communication. English translation of "Tvärkurturell kommunikation". Papers in Anthropological Linguistics 12, University of Gothenburg, Department of Linguistics.

Allwood, J. (1999). Are there Swedish patterns of communication? In H. Tamaura (Ed) Cultural Acceptance of CSCW in Japan & Nordic countries, Kyoto Institute of technology, 1999 (p.90-120).

Allwood, J. (2001). Cooperation and flexibility in multimodal communication.

Allwood, J. (2002) Bodily Communication dimensions of expression and content. *In B. Granström et al. (eds.), Multimodality in Language and Speech Systems*, 7-26. 0 2002 Kluwer Academic Publishers. Printed in the Netherlands.

Allwood, J. Multimodal corpora (2008). In: Lüdeling, Anke / Kÿto. Merja (eds) Corpus Linguistics. An International Handbook. Mouton de Gruyter. Berlin: 207-225.

Allwood, J., Ahlsén, E., and Tuna, G. (2013) Showing interest during first time acquaintance. (still not finished).

Allwood, J. and Cerrato, L. (2003) A Study of gestural feedback expressions.

Allwood, J., Cerrato, L., Jokinen, K., Navarreta, C. and Paggio, P. (2005) The MUMIN annotation scheme for feedback, turn management and sequencing.

Allwood, J. and Lu, J. (2011) Unimodal and Multimodal Co-activation in first encounters—a case study.

Bernal, G. and Shapiro, E. (2005). Cuban families. In: Ethnicity and Family Therapy. Guilford Press, Inc. New York.

Boholm, M. and Lindblad, G. (2011). Head movements and prosody in multimodal feedback.

Cavicchio, F. and Kita, S. (2013). Bilinguals Switch Gesture Production Parameters when they Switch Languages. In *The Proceedings of Tilburg Gesture Research Meeting*: Tilburg University.

Cerrato, L. and Skhiri, M. (2003) Analysis and measurement of communicative gestures in human dialogues. In *Proc. of Audio-Visual Speech Processing (AVSP) ISCA Tutorial and Research Workshop on Audio-Visual Speech Processing,* St Jorioz, France: 251-256.

De Vito, Joseph A. (2002). Human Communication. The basic course 9/E. Allyn & Bacon, Pearson. Boston, 2002.

Ekman, P and Friesen, W. (1969). The repertoire of non verbal behavior: categories, origins, usage, and coding. Semiotica I (1), 49-98.

Elliott, C. E. (1999) Communication Patterns and Assumptions of Differing Cultural Groups in the United States.

Ferré, G. (2010). Timing Relationships between Speech and Co-Verbal Gestures in Spontaneous French. In Language Resources and Evaluation, Workshop on Multimodal Corpora, Malta.

Giles, H. (2008) Communication Accommodation Theory. "When in Rome…" or not! In *Engaging Theories in Interpersonal Communication*. Sage publications, California.

Gibson, R. (2010) Intercultural Business Communication. (p.7)

Gómez Parra, E. (2009). Cultural differences among speakers of the same language. In *Sens Public*.

Hall, B. "J". (2005). Among Cultures. The challenge of communication. Thomson Learning Inc. USA.

Hall, E. and Reed Hall, M. (1990). Understand cultural differences. Germans, French and Americans. Intercultural Press, Inc. Maine. (p.7).

Hassanpous, R. and Shahbahrami, A. (2010). Human Computer Interaction Using Vision-Based Hand Gesture Recognition. In Journal of Advances in Computer Research (pp. 21-30).

Herrera Rodrigo, M. (1999). Análisis de los elementos no verbales en el discurso academic oral y de su relevancia en el aprendizaje del espanol como lengua extranjera. In *ASELE, Actas X*.

Hogrefe, K., Kögl, O., Ziegler, W., Glindemann, R. and Goldenberg, G. (2009). Measuring the Diversity of Hand Gestures.

Iverson, J. and Goldin-Meadow (1998). Why people gesture when they speak. In: Nature. Vol. 396. Macmillan Publishers Ltd.

Jokinen, K. and Pärkson, S. (2011). Synchrony and Copying in Conversational Interactions. In: *Proceedings of the 3rd Nordic Symposium on Multimodal Communication*. Editors: P. Paggio, E. Ahlsén, J. Allwood, K. Jokinen, C. Navarretta. NEALT Proceedings Series, Vol. 15. Electronically published at Tartu University Library (Estonia).

Kavakli, M. and Nasser, K. (2012). Impacts on Gesture Based Interfaces: A Case Study on Anglo-Celtics and Latin Americans. In *International Journal on Advances in Life sciences*, vol 4 no 3 & 4.

Kendon, A. (1986). Current issues in the study of gesture. In: *The Biological Foundations of Gestures: Motor Semiotic Aspects*. Routledge.

Kendon, A. (1990) An Agenda for Gesture Studies. In Semiotic review of Books. Volume 7 (3).

Kendon, A. (1992). Some Recent Work from Italy on Quotable Gestures (Emblems). In *Journal of Linguistic Anthropology* 2(1) June 1992.

Kendon, A. (1997). Gesture. In Annual review of Anthropology 26: 109-128

Klipp, M. (2001) ANVIL: A generic annotation tool for multimodal dialogue. In Proceedings of Eurospeech 2011 (pp. 1367-1379).

Krauss, M., Chen, Y. and Chawla, P. (1996). Nonverbal Behavior and Nonverbal Communication: What do conversational hand gestures tell us? In *Advances in experimental social psychology* (pp. 389-450). San Diego, CA: Academic Press.

Kress, G. (2009). What is mode? In *The Routledge Handbook of Multimodal Analysis*

LeBaron, M. (2003). Communication Tools for Understanding Cultural Differences. In *Beyond Intractability*. Eds. Guy Burgess and Heidi Burgess. Conflict Information Consortium, University of Colorado, Boulder.

Levine, T., Oark, H. & Ki, R. (2007). Some conceptual and theoretical challenges for cross-cultural communication research in the 21st century. In Journal of Intercultural Communication Research. Vol. 36, No.3, pp. 205-221).

Liebal, K., Call, J. and Tomasello, M. (2004). Use of gesture sequence in Chimpanzees. In American Journal of Primatology 64:3777-396.

Lind, M. and Salomonson, N. (2006) The role of virtual servants in e-interaction

Macauley, B. and Nakatani, K. (2006). Cultural influences on conversational gesture: Native Japanese speakers in United States.

McNeill, D. (1992*)*. Hand and mind: What Gestures reveal about Thougt. Chicago: The University of Chicago Press.

Meo-Zilio, G. and Mejía, S. (1980). Diccionario de gestos: España e Hispanoamérica. Tomo I: A-H, Bogotá, Instituto Caro y Cuervo. In *Foro literario*, num. 9-10, page. 42-43 (1981).

Piller, I. (2011). Intercultural Communication. A critical introduction. Edinburgh University Press Ltd.

Sainsbury, P. and Wood, E. (1977). Measuring gesture: its cultural and clinical correlates. In Psychological Medicine / Volume 7 / Issue 01 7 pp. 62-72

Sam, David L. and Berry, J. (2010). Acculturation: When individuals and groups of different cultural backgrounds meet.

Swedenmark, E. (2012). Gesterna vill ha sällskap. In Språktidningen, June 2012 edition.

Tsai, T. and Lin, C. (2012). Visual Hand Gesture Segmentation Using Three-Phase Model Tracking Technique for Real-Time Gesture Interpreteations System. In Journal of Information Hiding and Multimedia Signal Processing. Volume 3, Number 2, April 2012.

Tomasello, M., Call, J., Nagell, K., Olguin, R. and Carpenter M. (1994). The learning and the use of gestural signals by young chimpanzees: a trans-generational study. In *Primates* 35(2): pp.137–154.

Wang, S., Quattoni, A., Morency, L., Demirdjian, D. and Darrell, T. (2006). Hidden Conditional Random Fields for Gesture Recognition. In CVPR, New York City, USA.

Websites:
(All viewed on May, 2013)

Executive Planet
http://www.executiveplanet.com/index.php?title=Sweden:_Conversation

http://www.maxwell.lambda.ele.puc-rio.br/12443/12443_4.PDF

Countries and their Cultures
http://www.everyculture.com/Cr-Ga/Cuba.html#b

Jens Allwood´s publications
http://sskkii.gu.se/jens/publications/

Merriam Webster
www.merriamwebster.com