

A REVIEW ON A MODEL OF SHYNESS FOR ARTIFICIAL AGENTS IN THE MALAYSIAN LEARNING DOMAIN

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Abstract – Shyness is a difficulty experienced by many children in our country. Although it is a norm that Asians exhibit more colourings of shyness (e.g. timidity, passiveness, non-confrontational); studies conducted within the learning domain verifies that this personality trait is being acknowledged as a negative trait, especially among young learners (children) which is likely to affect their potential and performance in the academic platform. Teachers and peers may falsely believe that these students are less capable and less intelligent which may develop a poor perception towards them. However, these shy students find computer-mediated communication to be easier means of interaction than face-to-face contact with teachers. In-line with the Malaysian Education Blueprint (2015-2025) by the Malaysian Ministry of Education (MOE), development and use of Information and Communications Technology (ICT) (e.g. e-learning, educational games and other interactive learning platforms through computer interfaces) are very much encouraged. Hence, implementing an interactive artificial tutor (fit with a shyness model) to automatically adapt and interact to the user's emotional state could help in overcoming shyness, at the same time encourage these shy learners to confidently communicate and exhibit their capabilities. This research intends to review the background study on the usefulness of a shyness computational model which will be integrated with an interactive synthetic tutor. The aim of this study is to identify and capture the display features of colourings of shyness (e.g. timidity, passiveness, non-confrontational) through facial features (e.g. smiles, pouting) and vocal behaviours (silences, frequent pauses, filler words and turn-taking patterns) projected by shy young Malaysian learners (children aged between 9-11 years). These markers will be collected and constructed into a shyness model suitable for interactive synthetic agents used in the learning domain for teaching and training young learners in a typical Malaysian academic setting.

Keywords – artificial agents, shyness, computational model,

I. INTRODUCTION

Shyness is considered a potential cause for later development of social anxiety disorder which has also been linked to a list of adjustment problems including children's internalizing problems (problems that occur within the child) (Zahn-Waxler et al., 2000; Abry et al., 2017). In most cases, these children often appear to be withdrawn, fearful and shy which could further lead to problems such as anxiety, loneliness, difficulties in peer

relationship (e.g. peer rejection, poor friendship quality, victimization), and school issues (e.g. poor school liking, school avoidance), (Rubin et al., 2009; Abry et al., 2017).

Shy children tend to be more restrained in new social situations and distinguish such instances as intimidating. This situation which begins in an individual's childhood not only effects their learning and socialization in the classroom, but may also last throughout their lifespan and continue to play a role in affecting their adulthood as well (Hamer & Bruch, 1994; Coplan & Arbeau, 2008; Lao & Akseer, 2013). Increasing awareness for shyness, especially among children has been highlighted mainly due to teachers considering shyness as a possible problem in the school environment (Coplan et al., 2011; Abry et al., 2017).

School turns out to be more stressful for shy children than for non-shy children as they are required to work in large peer groups, such as group activities and group interactions which involves verbal participation (Hughes & Coplan, 2010; Coplan et al., 2011). Shy children have difficulties initiating and maintaining social interactions; they will very likely withdraw from these activities and will not participate in many academic and social growth opportunities (Rubin et al., 2009; Bayram Özdemir et al., 2017). Hence, these children are dominated by the anxiety, making concentration on academic activities very difficult. Although many teachers may prefer to have shy behaviors in their classroom as it can be more orderly and easy to manage, they view shy children as less capable of performing at a higher level, compared to their non-shy peers (Coplan et al., 2011). Teachers tend to rate shy children as less academically competent, and also hold stereotypes that shy children have inferior cognitive abilities. They expect shy students to lack the skills necessary for performing well in the classroom (Coplan et al., 2011; Lao & Akseer, 2013).

However, results of interview studies by Coplan et al., (2011) reports teachers would engage supportive

strategies and use praise (and other reinforcements) to help shy children feel more comfortable in the classroom. This is supported by a recent study which suggests that a classroom environment can foster engagement and achievement among students, especially for students who display anxious behaviors (Hughes & Coplan, 2017). Supportive and well-structured classroom may create a more comfortable learning experience for shy children, helping them to overcome feelings of anxiety and participate in class (Hughes & Coplan, 2017).

Today, there are many tools available especially with the use of ICT to aid in improved teaching and learning. Technology is now a well-accepted and integral part of education in schools and universities which supports pedagogical values over conventional means of teaching by providing efficient, engaging learning experience for students. The integration of technology in education has been diverse in nature ranging from tablets, smart artifacts, mobile phones, novel web based platforms and artificial agents (Ahmad et al., 2017; Fängström et al., 2017).

Artificial agents possess social features and physical representations suitable for the teaching and learning domain, which elasticities rich benefits particularly in engaging with students. These agents can recognize, adapt and respond to the verbal and non-verbal behaviours of learners especially shy students who may be comfortable interacting with agents compared to a human instructor (Barrow et al., 2012; Grasso et al., 2013; Ahmad et al., 2017; Fängström et al., 2017).

This aspect further supports the objective of this research which is in-line with the aim of the Malaysian Ministry of Education (MOE) to build an education system which is less focused on traditional academic pathways. According to the Malaysian Education Blueprint (2015-2025), educators are urged to transform the norm delivery model of teaching to technology-enabled innovations that deliver and tailor education for all students. Through this, educators are expected to integrate information and communication technology (ICT) into their respective education curriculum in order to offer more personalized learning experiences to all students (Ganapathy et al., 2017).

II. BACKGROUND STUDY

There are many factors that contribute to shyness. Shyness may be caused by linguistic delays, family background, home environment and cultural settings.

South East Asians, especially Malaysians are naturally simple, calm, timid, and low in initiative (Michael & Ibrahim, 2013). They are known to be more passive and subtle in displaying their emotions. The tradition is such that social initiative and assertiveness are not encouraged from young and a reserved manner in social interactions have become highly valued and considered desirable traits in the Malaysian society (Hamid, 2001; Cheah 2010).

Malaysians are also known to own a cultural trait of indirectness. Generally, most Malaysians choose not to say things outright, as they do not want to cause others to lose face. Openly disagreeing with someone is one way of causing that person to lose face, and is avoided (Cheah, 2010). A further reason Malaysians do not speak up as they fear of taking risks. Giving an answer that they are not sure of could result in giving an incorrect answer, thus causing shame and a loss of face, which is to be avoided at all costs. Therefore, keeping silent is the safer alternative (Hamid, 2001; Cheah 2010).

Studies have proven that children's engagement can be sustained and 'silence' can be manipulated through implementing a robotic system that can adapt and respond according to user states (Ahmad et al., 2017; Fängström et al., 2017). The use of agents has shown to be an efficient methodology to reach to reserved students in classrooms (Ahmad et al., 2017; Fängström et al., 2017). Therefore, integrating a shyness model into an interactive synthetic agent in the learning domain in a typical Malaysian academic setting may help overcome some of the hurdles these students face.

III. LITERATURE FINDINGS

1. Definition of Shyness

Shyness is a blend of fear that is universally manifested across cultures (Weiner & Craighead, 2010). Shyness is the tendency to feel awkward, worried or tense during social encounters, especially with unfamiliar people and environment. Most shy people may have physical symptoms like blushing, sweating, a pounding heart or upset stomach. They also tend to have psychological symptoms such as negative feelings about themselves; worries about how others view them and a tendency to withdraw from social interactions (Abry et al., 2017; Zahn-Waxler et al., 2000).

It is undeniable that almost every person feels shy at some point in life - new situations, new people, new environment or an unexpected event can cause anxiety, unease and nervousness. Some people's shyness is so intense, that it can keep them from interacting with others even when they want or need to — leading to problems in relationships; at academia or work place (Kingsbury, 2016). This is supported by Zimbardo where shyness is said to lead to inhibition among people and hinders the process of achieving healthy interpersonal relationships and professional goals. He also stated that shy behavior could be triggered by a wide variety of arousal cues (Henderson & Zimbardo, 2001).

2. Shyness and Culture

Many studies by psychologists and researchers have proven that shyness exists universally; however, it is not experienced or defined the same way from culture to culture (Heine & Buchtel, 2009). Early surveys by Zimbardo (1977), showed cultural differences in shyness - Japanese and Taiwanese students consistently expressed the highest level of shyness; Jewish students the lowest. As an extension to this survey, Pines and Zimbardo (1977), continued to study college students from Japan, Israel, and Taiwan. The cross-cultural studies turned up even greater cultural differences where in Israel, only 30 percent of college students report being shy--versus 60 percent in Japan and Taiwan.

Shyness is considered to be a negative trait in the Western countries. A study of American college students' individuation tendencies--the endorsement of behaviors that will make a person stand out, unique, or noticed--Asian students tend to score the lowest. They are much less likely to speak or act up in a social gathering for fear of calling attention to themselves (Bayram Özdemir et al., 2017). Shyness is a relative, culture-bound label. It is obvious that a shy Israeli would not be considered shy in Japan (Zimbardo, 1977). Similar studies conducted in China showed that shyness is positively correlated with peer acceptance in the age group of 8 to 10 years (Chen et al., 2016). However, when they compared with Canadian children of the same ages, peer acceptance was negatively correlated with shyness (Chen et al., 2016). In South Asian countries, shyness is considered to be an advantage because the societies expect to control oneself in front of others and to respect social rank of others (Bayram Özdemir et al., 2017). In a cross-cultural study by Carducci and Zimbardo, participants from India, Canada,

Germany, Israel, Japan, Mexico, and Taiwan were studied for level of shyness. The results of the study showed that the extent of population experiencing shyness varied from 31% to 55%. The lowest was by Israel and the highest was reported in Japanese participants. Cultural context also influences the connection between shyness, scholastic achievement, and social popularity, as well as parental education among students (Bayram Özdemir et al., 2017). Carducci and Zimbardo explains that collectivist culture promotes esteem of the group over that of the individual. As a result, it fosters self-consciousness and shyness.

The present research attempts to study the shyness inhabited among Malaysians, especially children in a typical Malaysian learning environment.

3. Shyness in Children

A shy childhood may be a series of lost opportunities. As shy children grow older, shyness can become a central part of who they are, both in terms of their personality and in how they view themselves (Evans & Beinert, 1992). Hence, shyness can develop into a stable character and last a lifetime.

A study by Swallow (Colonnesi et al., 2017), reported that approximately 40% of children are shy. Another study by Lazarus, found that 38% of fifth-graders self-reported as shy and 59% of those children said they wished they were less shy.

Some children develop shyness over time from their experiences and others are born shy. Shy children often feel shy in a variation of situations, which could also last for long period of time. Being shy can have negative effects on children's relationships and academic outcomes.

Shy children tend to form more dependent and less close relationships with teachers as compared to their less shy peers (Coplan, & Prakash, 2003). They also are less likely to initiate social contact and more likely to withdraw from peer interactions (Coplan, & Prakash, 2003). Shyness has been strongly linked to peer rejection, exclusion, loneliness and victimization by various researchers (Rubin et al., 2009). Figure 1 illustrates a transactional model which describes the transition flow beginning from the possible point of development of social deficits (which may lead to colourings of shyness) in infants to the growth of potential negative outcomes (such as; negative self-regard, loneliness, peer rejection, victimization, anxiety) (Rubin et al., 2009).

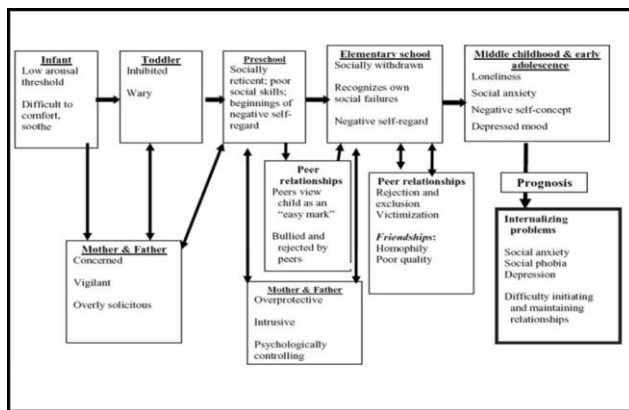


Figure 1: Transactional model which describes the transition flow from the beginning of social deficits (in infants) to the development of potential negative outcomes caused by it (adopted from Rubin et al., 2009).

3.1 Shy Children at School

School is an unavoidable environment for a child, where he or she has to go through and interact with peers, teacher, staffs and other individual (e.g. parents of their peers), at various points throughout their academic journey.

Researchers Coplan and Arbeau (2008), stated that for a shy child, the school environment may be a source of considerable stress because of factors such as the presence of a large peer group and academic demands for verbal participation. Social fear and self-consciousness may be worsened in these children leading to their withdrawal from verbal engagement with peers and teachers. With time, classroom verbal demands may become associated with feelings of anxiety thus, interfering with the shy child's ability to concentrate on schoolwork and achieve academic success (Coplan & Arbeau, 2008).

Shy children are often found to be independent. This attitude leads to many problems at school, as research has indicated that a shy child who is likely to be independent is associated with a host of negative outcomes including academic difficulties, loneliness, less favourable views in school, difficulties with self-direction in class and increased likelihood of additional behaviour problems (e.g., conduct problems, poor attention span) at school as compared to their classmates who have a lower level of dependency (Rubin et al., 2009).

Gazelle, found that shy children are at increased risk for adjustment difficulties when placed in classrooms with negative emotional situations, which may include classrooms dominated by disruptive student behaviours

and those in which are conflicts between students and the teacher.

3.2 Shy Children and Teachers

Studies shows that teachers not only underestimate the intelligence of shy children but also to perceive them as less intelligent and less academically competent (Rubin et al., 2009). Coplan at el., reported that teachers who rated themselves as being shy were more empathetic towards shy children and viewed them as being just as intelligent as their non-shy peers (Coplan et al., 2011). Yet, those shy teachers also agreed with other teachers in saying that quiet students would do less well academically. Lao at el., found similar results where, outgoing teachers viewed outgoing children more favorably and gave them additional jobs around the classroom, such as being line leader or in charge of passing out papers. At the same time, some teachers believe that children will grow out of their shyness and see it as a short-term phase in their life Coplan et al., 2011; Lao & Akseer, 2013).

Children who have higher quality relationships with their teachers are more engaged in the classroom and have higher levels of academic achievement (Rubin et al., 2009). Similar situation seems to be true for shy children also. Chang, found that in classrooms where the teacher is more perceptive to the child's needs, empathetic, and warm, shy children are more inclined to come out of their shell. They feel more socially competent and more positive about themselves in social interactions.

3.3 Shy Children and academic achievement

Academically it seems that shy children are also at a disadvantage. When one is feeling shy, he or she may not speak very much and be hesitant to contribute to conversations for a variety of different reasons (Coplan & Arbeau, 2008). Thus, they are unlikely to contribute to class discussions. This also may contribute to the reason of shy children are found to have less developed language skills than non-shy children (Hughes & Coplan, 2010). This may be because they intend to talk less and have not had the opportunities to develop their language skills as other non-shy children do. Some researchers also suggest that shy children are less academically engaged than their less-shy peers and this may stem, at least in part, from their reluctance to engage in classroom activities (Bayram et al., 2017).

An interesting fact through studies also shows that, since social situations are uncomfortable, shy children might throw themselves into schoolwork and focus on doing

well and succeeding academically. However, most research has not supported this. It is thought that because learning often involves taking risks, collaborating with others, stepping out of your comfort zone, and often asking for help, shy children are not comfortable in academic settings (Hughes & Coplan, 2010; Bayram et al., 2017). Other studies by Nowakowski et al., 2009 have shown that shy children often perform worse on tests than non-shy children. This could lead shy children to withdrawal from academics for fear of evaluation and becoming embarrassed (Deng et al., 2017). For example, being called on in class to answer a question, solving a problem on the blackboard or making a speech all have the perceived risk of social evaluation. For a shy person, these tasks are often scary and can cause considerable anxiety.

IV COMMON PEDOGOGICAL STRATEGIES

Research suggests that teachers tend to use different strategies with shy and energetic children. Interaction a teacher establishes with students tend to have an impact on the children's cognitive, social, and behavioral development (Hamre & Pianta, 2005; O'Connor & McCartney, 2007; Raver et al., 2011). These interactions such as: accurately perceiving and interpreting children's behavioral cues and responding appropriately to meet children's social, emotional and cognitive needs; promoting children's engagement, motivation, and persistence through encouragement and support; helping children make social connections; and supporting independence, can be strategies that teachers apply to facilitate positive developmental outcomes for children (Copple & Bredekamp, 2009; Hamre et al., 2014).

Teachers are more likely to use social-learning strategies with shy children (e.g., encourage social interaction), approach them with warmth and create a positive classroom environment that encourages self-expression, peer interaction and teacher-child interaction for shy children (Brophy and McCaslin, 1992; Arbeau & Coplan, 2007; Bosacki et al., 2011; Coplan et al., 2015).

1.1 Interactive Learning and Agents

Over the last decade, digital technology has been increasingly used for educational purposes. The motivation behind this growing trend is the belief that information technology can be utilized as a powerful tool to assist learners with the achievement of knowledge through interactive learning (Groff, 2013).

Animated characters and agents are also no longer new to e-learning users. Today, users can interact with an agent through a combination of speech and gesture where these agents are equipped with affective and emotional capabilities, and speech to converse with the pupils.

Social assistive agents are being developed as companions for children in domains such as education, therapy, entertainment, and healthcare. Shy children are expected to interact and speak in more "social" ways with these interactive agents (Fängström et al., 2017). These children may spend more time speaking overall with an agent that is built with a model which recognizes the emotional state (colourings of shyness) of the child and subsequently manage to establish engagement with them and response accordingly (Ahmad et al., 2017). The use of a computer reduces the pressure of direct eye contact, which can help children to relax and feel at ease, thus, facilitating both rapport and communication (Barrow, 2012). Computer assisted approaches especially when involving children are being used in a wide variety of contexts, ranging from hospitals to schools (Barrow, 2012; Grasso et al., 2013 Fängström et al., 2017).

Thus, it is expected that when the children interact and communicate with the agent more often, they may be more comfortable towards the empathetic artificial tutors which is perceived to be friendly and understanding towards the young learners compared to their teachers.

1.2 Nonverbal Communication

Non-verbal communication are cues (e.g. projection of emotions, feelings, moods, social attitudes) displayed outside conscious awareness. These cues are usually projected through facial expressions, vocalizations, gestures, postures and more (Mohammadi & Vinciarelli, 2012). Non-verbal communications are often representation of subtle emotions (social affective states) such as shyness, shame and embarrassment (Costa et al., 2001; Ekman & Rosenberg, 2005). Examples of non-verbal cues that typically signaling embarrassment are gaze patterns, face expressions and head movements (e.g. gaze down, head movement down, awkward smile, face touch); cues gesturing shyness, discomfort, and other negative feelings are also exposed through self-protection gestures like folding arms and crossing leg, self-touching, manipulation of small objects, rhythmic movements of legs (Keltner & Cordaro, 2017). Similarly, vocal behaviors which represent non-verbal communication includes five major components; prosody, linguistic vocalization (e.g. "ehm", "ah-ah"), and non-linguistic

vocalizations (e.g. cry, laughter, shouts, yawns, sobbing), silences and turn-taking patterns (Mohammadi, & Vinciarelli, 2012). Prosody usually influences the perception of several personality traits, for example timidity, passiveness (colourings of shyness), competence and persuasiveness. Linguistic vocalizations are used typically to communicate hesitation and uncertainty, meanwhile non-linguistic vocalizations are used to display strong emotional states such as happy or sad and to an extend shyness (e.g., to cry when unable to answer questions, and feeling ashamed in certain stressful situations). Silences and pauses typically express hesitation, cognitive effort or the choice of not talking even when asked to do so (may also due to being shy). Finally turn-taking patterns is the mechanism through which people take turns in conversations, where the time taken to response also demonstrations a significance meaning (e.g. when an embarrassing conversation or topic takes place which causes awkwardness and shame) (Colonnesi et al., 2017).

Non-verbal cues can be detected, analyzed and synthesized with automatic approaches. These markers of non-verbal communication can be used as features that is embedded into agents and computer interfaces in order to recognize certain emotions and social attitudes. Figure 2 shows a systematic overview of the main forms of non-verbal communication (Argyle, 2002).

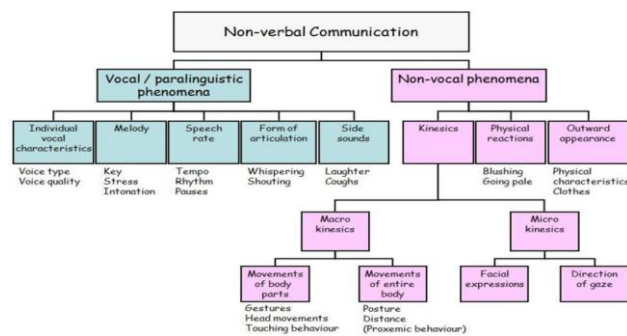


Figure 2: Overview of the main forms of non-verbal communication (adopted from Argyle, 2002)

1.3 Nonverbal Behavioural Cues

Nonverbal behaviour is a source of signals which are projected to convey information about feelings, mental state, personality, and other traits of people which happens through a wide spectrum of nonverbal behavioural cues (Vinciarelli et al., 2009). Shyness is typically demonstrated by a range of specific shy features from facial expressions (e.g., smiling), gaze or head aversions, gestures and postures, and vocal behaviours

(e.g., prosody, silences and turn-taking patterns) (Ekman & Rosenberg, 2005; Vinciarelli et al., 2009; Keltner & Cordaro, 2017). Table 1 shows some of the common nonverbal behavioural cues displayed by shy individuals (Vinciarelli et al., 2009).

Different nonverbal cues have different impact on our perception of one's affect state. However facial expressions and vocal behaviours typically influences the most when an individual exhibits shyness (Mohammadi & Vinciarelli, 2012).

<i>Silent Behaviour</i>		
PASSIVE	ASSERTIVE	AGGRESSIVE
Confusing silence	Calming silence	The "silent treatment"
Pouting	Silence accompanied by action	Disapproving silence
Silent fear	Silent encouragement	Silent disinterest
<i>Vocal Non-verbal Behaviour</i>		
PASSIVE	ASSERTIVE	AGGRESSIVE
Voice too soft	Moderate Loudness	Voice louder than necessary
Frequent Pauses, Filler words (uhh, aahh)	Even speed-fluent	Fast speech
Questions	Declarative sentences	Exclamatory sentences
<i>Facial Non-verbal Behaviour</i>		
PASSIVE	ASSERTIVE	AGGRESSIVE
Little eye contact	Open, Direct eye contact	Glaring, Staring
Tensed facial muscles (fear)	Relaxed facial muscles	Tensed facial muscles (anger)
Pleading, Timid look	Confident, Engaged look	Impassive, stony look
<i>Postural Non-verbal Behaviour</i>		
PASSIVE	ASSERTIVE	AGGRESSIVE
Fidgeting, wringing hands	Open hands	Clenched fists
Hands behind back or in pockets	Hands at sides	Finger pointing
Nervous, Shifting body	Relaxed body position	Rigid body position
Standing at considerable distance	Standing at a respectful distance	Standing very close
<i>Touching Non-verbal Behaviour</i>		
PASSIVE	ASSERTIVE	AGGRESSIVE
Not touching	Holding as necessary to calm or interrupt	Grabbing to induce compliance
Nervous touching	Touching to aid communication	Poking to make points
Feeling too timid to comfort or encourage through touch	Touching to comfort or encourage	Withholding the comfort or encouragement of touch

In this research, we intend to focus and study selected facial and vocal cues that are displayed by shy children (in a typical Malaysian academic setting).

Nonverbal facial cues (such as smile, awkward lip movement, pouting) accounts for cognitive states and personality traits such as shyness (Ekman & Rosenberg, 2005). Likewise, vocal behaviours represents all actions that do not include language or verbal content in speech (Vinciarelli et al., 2009).

IV CONCLUSION

Malaysians are generally known to project more subtle, self-conscious emotions such as shyness, passiveness, timidity and indirectness; to name a few. A study based on Malaysian learners by Hamid (2001), shows that the concept of shyness or "malu" is highly prevalent within the Malaysian society - in academic, professional, as well as inter-personal spheres. "Malaysian students don't feel that they have the "right" to question what is being taught until they have completely understood all aspects of it. Moreover, they avoid being critical out of respect for the teacher, so that the teacher will not lose "face" in front of other students, and to preserve harmony in the classroom, so that everything runs smoothly. There is also an element of "face-saving mechanism", (Cheah, Economics Network, 2010, para 3).

Virtual agents and interactive virtual environments have shown promise as therapeutic approaches for social conditions, such as shyness (Fängström et al., 2017). The incorporation of agents in different levels of education by many researchers has shown vast positive results in attracting learners especially children (Fängström et al., 2017).

Agents have been implemented in classrooms, particularly for children who are nonverbal and have social implications. However, a suitable culture-specific model is needed to be fit into these agents based on the user's cultural background. Affect-sensitive agents in learning that are not equipped with the ability to recognize culture-specific emotions may fail to achieve the ultimate goal of improving learner's emotional experience with machines.

The current research focuses on the learning domain in Malaysia where learners are more timid, passive, shy, indirect and tend to mask their real state of emotion. In this study, we attempt to address this challenge by using facial features (e.g. smile, pouting) and vocal behaviors

(e.g. silences, frequent pauses, filler words and turn-taking patterns) to identify the patterns of emotion markers that indicates traces of culture-specific emotions for example, colourings of shyness. The identified features from these cues will be developed into a shyness model. We also intend to evaluate this model by integrating it with a synthetic interactive agent.

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