

Emotional Agents Outreach: An Undergraduate Research project

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Abstract—*Emotions are psychological reactions that develop as a consequence of certain cognitions and interpretations. In this research we will introduce the OCC (Ortony, Clore, and Collins) theory as our model for understanding emotions. The use of advanced emotional agents has been used on younger kids in a form of video games and animated movies. But the use of this technology in the teaching learning environment has not yet been popular. So, in our research we will introduce the use of agents in teaching learning environments in a way they would attract and inspire younger kids to be more interested in studying. We will be using Scratch, a programming language used to create agents in a simpler way, as our tool. After this research, with further modification and studies, we will be able to get an updated educational system which involves emotional agents that will help students attain their intended success.*

Keywords: Emotional Agents, Emotion Theory, Decision Making, Emotional Believability

1. Introduction

Emotions are not just things felt inside and expressed on one's face, they go beyond that. They have the power to affect that individual's decision making, and the response of others around. For instance, let us take kids; they react fast for emotional facial reactions better than spoken words. Just by looking at the facial expression on their teachers or parents they try to fix whatever fault they have done to get rid of the consequence that might come next. So we see how one's emotion can affect the response of the other person around. Not only that, but for instance, if someone goes to a shop planning to buy a PS3, and finds out, at the store, that xbox360 is much better, then the person will end up buying the thing he have not planned to buy. From this we understand how it affects one's decision making. So emotions play a great role in everybody's day to day life.

This is the reality of emotions on humans, but the main issue now is how to implement this fact of emotions on agents. The advancement of Artificial Intelligence (AI) has given us advancements in creating emotional agents. And these emotional agents have been improving their believability, but still they have that robotic feature that restricts their decision making being influenced by their emotion. So, finding a solution to minimize this unbelievable characteristic and

create a more advanced emotional agent is what is interesting nowadays.

Nevertheless, our research concentrates on applying the emotional agent and introducing it to younger kids like K-12 kids. Nowadays students in the elementary and high school level are familiar with the concept of emotional agents. Video games, computer games, and animated movies these all have done their part to make the kids familiar to this phenomenon called agents. Moreover, thanks to programming languages like Scratch these kids are getting more aware of this issue and in the near future the hope for believable emotional agents and the application of this knowledge in younger kids will become a reality.

Our research will give a good stepping stone for further studies on how to use agents as tutors, study pals, and teaching aids for the kids. We will concentrate more on the introduction part of the idea and we will give ways for future studies. Because it still is an area to be worked on.

2. Research Background

The existence of agents can be traced back to the beginning of artificial intelligence (AI). The AI is a branch of computer science dealing with the simulation of intelligent behaviors in computers. With further studies and researches on AI the creation of agents [1] was performed, and through time these agents were improved and modified to have emotions, and they were called Emotional Agents. The advancement of these emotional agents is also improving the need and study of AI , from which this knowledge first arrived. Any kinds of video games, or computer games, robots, and all actuators, are composed of agents. And this agents need to be emotional in order for the agent to be more realistic. If it is a video game or a computer game then the interaction of the agent is most probably with humans; so, it needs to develop an emotional behavior that could help it interact properly with the human [2], [3], [4].

The first key method for the advancement of emotional agents was having the knowledge to understand emotions very well, and for this there were lots of ideas forwarded from different intellectuals. But for our research we will be introducing the OCC (Ortony, Clore, and Collins) model. The OCC theory gives the right understanding of the detailed emotions available. After the word "emotion" has been understood then it was implemented on the agents and as we said above the knowledge of emotional agents appeared.

Consequently, the next issue was on how to make these emotional agents believable. Humans have emotion and this emotion plays a great deal in their decision making [5], [6], but the effect of emotion on the decision making ability of the agents is not quite similar. This fact shows us that we need further study and work in order to make them believable.

2.1 The theory of Ortony, Clore, and Collins (OCC)

Ortony, Clore, and Collins developed their theoretical approach with the aim to implement it in a computer. They wanted to lay the foundation for a computationally tractable model of emotion. In other words, they wanted an emotion that could in principle be used in an Artificial Intelligence (AI) system that would, for example, be able to reason about emotion. Their theory assumes that emotions develop as a consequence of certain cognitions and interpretations. And they give three aspects that determine these three cognitions which are events, agents and objects [7]. Below Figure 1 is a clarification of what they gave as the link between these three determinants of emotion, and we also assume this as the right understanding of emotion.

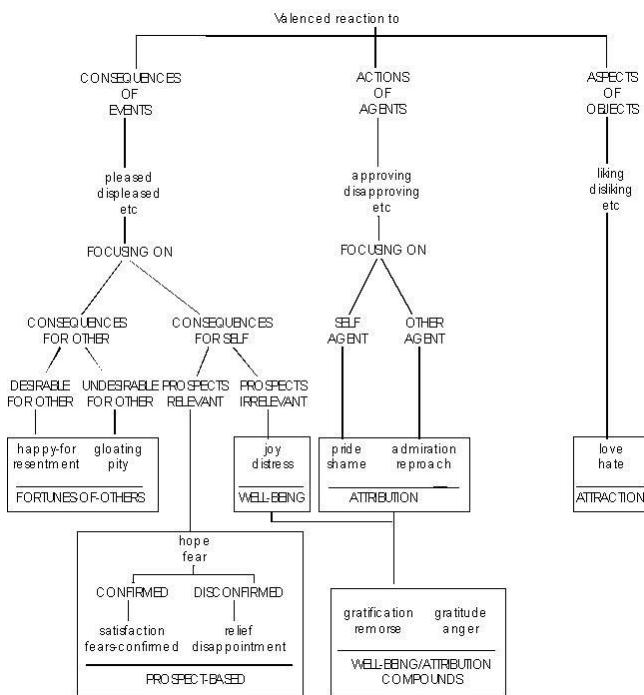


Fig. 1: OCC Model - Determinations of Emotions

2.2 On Making Believable Emotional Agents Believable, Andrew Ortony

The first feature for an agent's emotion to be believable is its consistency and coherence. Consistency relates to the

feature of the agents reaction to a certain stimuli to remain constant in similar occasions. For instance, if one person shows a frightened reaction when facing a certain animal today then we expect him to be frightened to that same animal tomorrow. This phenomenon is really important. Moreover, we have coherence together with consistency. The reaction or the emotion one shows for a certain situation should not only apply specifically to that local situation, but it should be applicable in a more global manner [8].

So as to the believability of these emotional agents is concerned, many have done their part to make it more consistent and coherent. But still it is a hot issue because we need to know how to make an agent capable of managing all possible stimuli that it might face, and how to give the right reaction fast enough. So as to the believability of these emotional agents is concerned, many have done their part to make it more consistent and coherent. But still it is a hot issue because we need to know how to make an agent capable of managing all possible stimuli that it might face, and how to give the right reaction fast enough.

3. The Use of Emotional Agents as Tutors on Updating the Educational System

This research mostly concentrates on the formation of believable emotional characters and their application on younger kids. From previous researches we have seen what it means by emotion and their believability. So our work is combining these two with relation to kids and bringing a more useful outcome.

In this twenty-first century the one thing that is in the mind of every younger kid throughout the world is the adaptation of video games. Not long ago if a teacher asks his or her students for their hero they might give names like Albert Einstein, Thomas Edison, Martin Luther King, Jr., and many more in their areas of studies. Nevertheless kids of this generation might not even know who these people are. They are not introduced to any of them; as a result, they are not their heroes. It is either a video game character or an animated movie character that they might give you as their hero.

The above argument brings us to the main reason why we chose to do our research on this topic. We need these younger kids; we need them to be the future scientists, politicians, artists, economists, doctors, engineers, and so on. You can name it whatever you want, but the important thing is that we need to build this generation in order to create a better world in the future. With this in mind let's introduce emotional agents as teaching tools to these younger kids.

Many younger boys and girls, generally 90% of the kids between the age of 11-17, spend much of their time playing basketball video games on xbox360 or PS3, but if we have the SpongeBob the cartoon character or Kobe Bryant the basket ball legend video game character as their tutor then

these kids will for sure spend much of their time studying math, history, or any other subject.

Education by itself is related to our emotions. We have to be emotionally inclined to the subject in order to like it, and if we do not like it then our performance goes down. So what we are trying to say is the method of the teaching system needs to be updated. Emotional agents can be a great use in this regard.

Scratch [9] is one of the programming languages that exist today which can be used in this situation. This program does not need much knowledge on any programming languages. It has its own tutorial lessons that could help the user learn how to use them; so, either parents or teachers can create tutorial lessons with the use of the emotional agents featuring the kid's favorite characters as supplementary teaching materials [10]. Not only that but even the kids can use Scratch to create their own their study pals using their favorite characters or even using their own imagination. This way the students will be excited and more eager to learn their lessons. For instance in the following images we will see two sports legends that happen to be idols for basketball and soccer fans respectively.

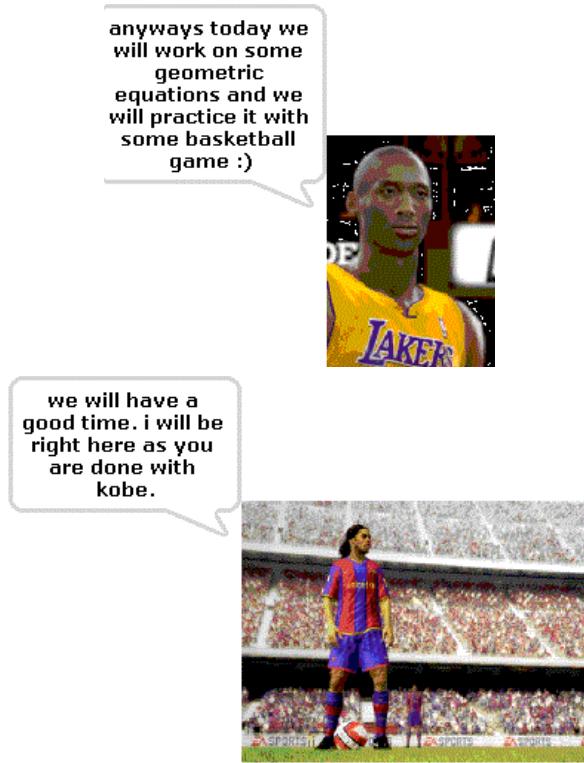


Fig. 2: Sample Programs with Sports Legends for Tutoring

The above two images in Figure 2 were copied from a program that we did using Scratch. It is a pre tutorial introduction and the program keeps on with the tutorial lessons and a break time for the kids to play games in which

they can practically grasp the knowledge that they gained theoretically.

Creating the awareness and introduction of this interesting development is being done by some summer science camps in different areas. Even though it might take a while before this knowledge reaches everywhere, it is growing in a promising speed. By creating the awareness starting from preschool teachers and parents we can decrease the time it takes to get it advanced. The main aim should not only be introducing it as a way to entertain the students but rather in a way to use it as a teaching tool; with this we can get a potentially fit educated generation.

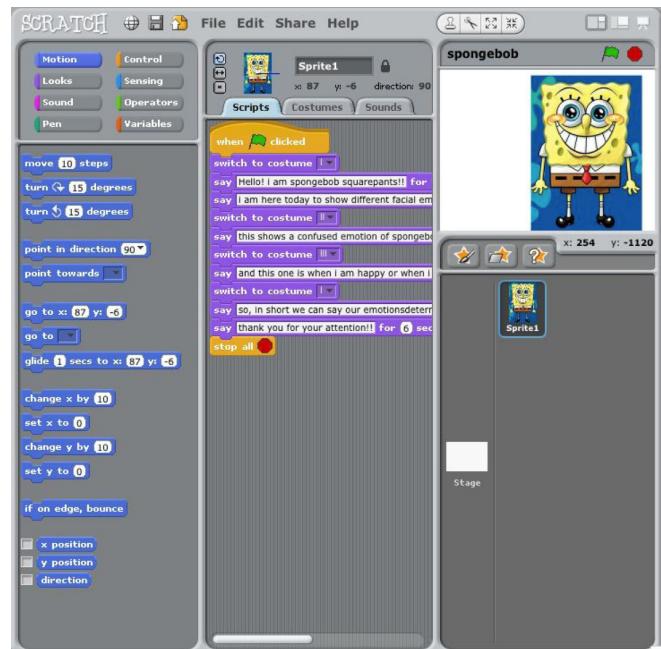


Fig. 3: SpongeBob Tutorial Program

The above Figure 3 illustrates how the Scratch program can be used to form the tutors. In this case SpongeBob, one of the kids' favorite characters, is used as an agent to tutor on a certain topic. The resulted program includes the SpongeBob with different emotional facial expressions, and some are listed in the following Figure 4.

After the agent is given its task it will be ready to give the tutorial for the student; nevertheless now the question becomes what will happen if the student asks a question? This is where we need the believability of the emotional agent. We need our agent's decision making to answer the question to be correct and believable. Since it is a teaching learning environment the agent is supposed to have coordination with the student. To answer this question we were forced to use other algorithms than the once present on Scratch. But since this is a short research and the result is going to be applied on people who do not have the knowledge of forming algorithms it is better to keep it simple and just introduce Scratch and its applications.



Fig. 4: Resulted Tutorial Program with Different Facial Expressions

In general, forming an agent whose decision making is dependent on its emotions and is able to make the human computer interaction (HCI) lively and realistic is a whole accomplishment and fulfillment.

4. Conclusions

This paper has attempted to address the possibility of incorporating emotional agents in the educational environment to enlighten younger kids in a more inspiring and attracting manner. It started by defining emotions in general to making them believable and useful on agents. Then it stated how to introduce the usage of emotional agents on the teaching and learning environment with the use of Scratch as a programming language.

Future studies should be done in order to make it more applicable. With future work the agents' decision making will be improved and they will become more believable. Not only that but future works are needed to form algorithms which are easy to introduce for the society; so that they can create a more developed agents in programming languages like Scratch [11].

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