A Model for Socially Intelligent Merchants

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ABSTRACT

In this work we propose and test a new model for socially intelligent merchants to be used in Role Playing Games. The objective is to enhance the player's experience in terms of immersion when interacting with merchants and increase the merchants' believability as Non-Player Characters, while minimizing the necessary authoring effort. The model is based on previous research on socially intelligent characters and vendor techniques and is specified by merchant and character traits. It gives a designer the possibility of creating, without much effort, many kinds of merchants based on their traits, that convey different personalities with an arrangement of different possible interactions.

An abbreviated version of the merchant model was implemented and tested in the game Conan Exiles using its modding tool. The results of these tests were very positive, with merchants using our model proving to be significantly more enjoyable and believable when compared with a merchant without the model. The results also showed that implementing the new model did not compromise the flow of the interaction between the player and the merchant. In the end, there was an almost unanimous preference by the players for interacting with the merchants that had our model in relation to the one without it.

KEYWORDS

Merchant; Video-games; Social

1 INTRODUCTION

Trades, involving exchange of goods, can be traced back to prehistoric times, they have been practiced since the late paleolithic and early neolithic times [4].

It is evident that trades are much more than a simple exchange of x product for y product, there is a lot more to take into account. Every time we physically buy something from someone, we have a wide range of possible interactions, from the simple greetings and transaction, to the bargain of the price, asking for advise from the merchant, the evaluation of current promotions or even a conversation about other topics.

Unfortunately, these range of interactions is not translated very well into video games, where merchants, most of the time, are a tool and not a character with social aspects attached to it.

As a result of this, for example, the interactions with merchants in these kind of games can feel unrealistic and, most of them, feel like a simple means to do transactions instead of a simulation of a real vendor who is trying to make a living and may empathize or have a bad impression of the player.

Sometimes the players find a game so engaging that all their attention is focused on the game, even to the extent that they feel as being 'in the game'. This experience is referred to as 'immersion' [12], and many times, that immersion is bottlenecked by the results of interactions between the player and a character.

With this work, we aim to find if creating a merchant with more social intelligence, based on state of the art social architectures and with a deeper range of possible interactions in a video-game translates to an improvement in terms of player experience with said game in terms of believability, engagement and enjoyment.

With that said, our goal is to create a social model that, when applied to merchants in a Role Playing Game, increases the range of possible interactions depending on their individual characteristics, allowing the player to create a relationship with them, but always balancing authoring effort of the developers when creating these NPC's.

The implementation of such model in a Role Playing Game would give us the possibility of testing the impact that these changes to the merchants have on the players. As such, we choose to implement the model in Conan Exiles [7], a recent commercial game that fits the criteria for the genre of games where our model could be of use and has a versatile modding kit that allows the alteration of the game assets.

In this document, we present a model designed to met the goals stated above, as well as the work that helped creating that model. Then we describe the implementation of an adaptation of the model into a commercial video game, and the creation of a test scenario. Finally we interpret the results of the tests realized, drawing conclusions about the work created and our hypothesis.

2 RELATED WORK

This work, due to his nature, touches on several distinct fields of expertise, mainly: trading techniques, psychological models regarding relationships and the state of the art when it comes to social architectures.

2.1 Trading techniques

Psychology plays a major role when dealing with trading techniques. Studies and experiments have been made with the goal of identifying techniques that increase the compliance of someone with or without any obvious source of pressure [14]. As such, techniques like Door-In-The-Face, Low-Ball and Thats-Not-All work by manipulating the expectations of the subject to increase the appeal of a request and, as such, the likelihood of him or her to accept that request. We are going to summarize these techniques used

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regularly in sales, to improve the chance of a merchant closing the deal with the client.

- **Door-In-The-Face:** This technique works by getting a 'no', to increase the change of getting a 'yes' after, due to a high contrast perceived by the person who is the target of this technique. Proposing an extreme request which is rejected and then moving to a smaller request increases compliance with the smaller request. If only asking for the smaller request, the merchant faces less compliance than if opting with the first technique. [5].
- **Low-Ball:** The Low-Ball technique takes advantage of the commitment developed by people after they accept some minor request in order to keep them accepting other, more costly requests [13]. People, when complied with an initial small request were found to be more likely to agree to a similar but larger request [3].
- **That's-Not-All:** That's-not-all involves the incremental appeal of a deal without giving the client a chance to think or reply to the constant changes. This makes the client see the contrast between the first proposal and the current one and feels an increasing obligation to purchase the product to compensate for the merchant's concessions [2]. This technique effectiveness can be explained by two theories. The first one because the merchant negotiates on the purchase price, making the costumer feel obligated to respond to the act by agreeing to the better price. The second, since the original price alters the anchor point against which the purchase decision is made.

2.2 Relationship Models

2.2.1 Friendship Model. A friendship model was looked at, giving us structure with well defined stages according to the relationship status between two people [17]. These stages are: strangers, casual acquaintance, friends, deep friendship and self-intimacy. Each stage has it's own characteristics and conditions of entry. This is a model that can very well be implemented in what we propose to do, with some adaptations to fit the context of our work. The fact that there are several stages with thresholds to be met in order to access them and specific characteristics to each one is something that can easily be transposed into a social model.

2.2.2 Heiders' Theory of Balance. This theory proposes that a relationship is a ternary association between two persons and a concept [11]. For example, if the person A likes the person B and this person has an interest in the item X, then, the person A is more likely to show interest in the item X as well.

The friendship model can help creating a stage-based relationship, either with the stages presented in said model or with other that could fit better the context where this should be applied. As for the Heiders' Theory of Balance, it helps determine conditions where a relationship can be stronger (for example, if both the player and the merchant share the same interests).

2.3 Social Architectures

There are a number of systems developed by academic groups with the same goal of improving the interaction between characters or with the users. We studied several of them to look for characteristics that could fit our model.

2.3.1 GAMYGDALA. is an emotion engine for games, based on the OCC model [18], that aims to add emotions to Non-Player Characters in games easily. In order to create an NPC with simulated emotions, the developer has to define goals and annotate game events with a relation to those goals. Given this input, GAMYGDALA will find an emotion for that NPC (according to the OCC model already mentioned) [22].

2.3.2 SGD. Support Group Dynamics defines the knowledge that each individual should build about others and the group, and how his knowledge drives their interaction[23]. It focuses on believability of characters when they interact as a small group. This work is inspired by theories developed in human social psychological sciences.

2.3.3 FAtiMA. (Fearnot AffecTIve Mind Architecture) is an Agent Architecture with planning capabilities designed to use emotions and personality to influence the agent's behavior [6]. This architecture is modular in order to accommodate just the necessary features without compromising simplicity and size. This was done to solve the problem that was created when several institutions and scenarios (such as FearNot! [19], ORIENT [1], and a process Model of Empathy [25]) started to implement this architecture, making it scale very fast in terms of compatibility. The modules themselves are generalized and independent from each other so that they can be applied to a scenario later on and to avoid conflicts between components. This architecture is composed by a core (FAtiMA Core, Figure 1) that serves as a base for the components to be added later: When perceptions are received, the agent's memory is updated and

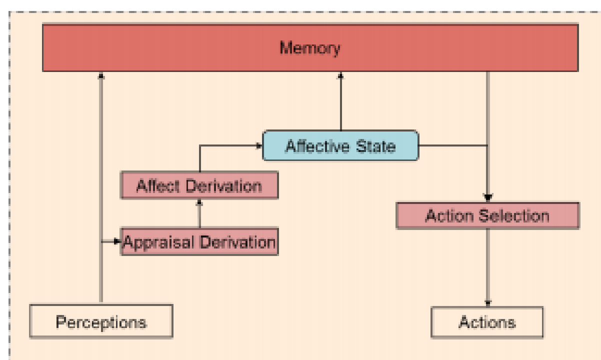

Figure 1: FAtiMA Core [6]

the appraisal process starts. The result of the appraisal process is stored in an affective state and later used to influence the action selected.

The appraisal derivation is responsible for attributing appraisal variables (like desirability) according to the input (perceptions).

The affect derivation takes into account the appraisal variables and an appraisal theory and generates an affective state (mood).

2.3.4 Comme il Faut. (CiF) is an artificial intelligence system and authoring strategy for creating game-based interactive stories about relationships and social interactions between characters [16]. CiF's architecture has the following main features:

- Characters do not follow a template, their actions are chosen based on their traits.
- Characters' decision making is flexible.
- Social interactions can have a snowball effect across multiple characters.
- Details and outcomes of previous interactions are stored to help keeping sense of continuity in social exchanges.

As for more detailed information, CiF is comprised of 4 main components: Social State, Characters, Social Exchanges and Trigger Rules. Together this components interact with one another with one another to trigger rules that may change the social state of the environment.

There are applications of this architecture were implemented in several games. For example prom week, a social simulation game about the dramatic week leading up to a high school prom. Players influence the social landscape indirectly by having the characters engage in social exchanges [15].

Another relevant aplication of this architecture was done in Cif-CK [10], a modification of CiF implemented in the comercial game The Elder Scrolls: Skyrim [27]. Changes were done in order to contextualize the outcomes of the model, and there were features added, like the possibility of characters having beliefs, that enrich not only the model, but also the experience of the player.

2.4 Discussion

We can take inspiration from elements of all the fields of expertise mentioned above. But not only from there, some current video-games implement some innovative ideas that, despite not being quite what we want to make, are worth mentioning. For example, in the video-game Witcher 3 [24], the merchants show preference for buying items similar to those they sell, this is a small feature but one detail that can help with the immersion.

The trading techniques can help achieving a more realistic and believable behavior to the merchants NPC's by bringing their actions closer to what it is currently done by real merchants and vendors.

As previously said, the friendship model can give us a base for what to aim for in terms of creating a relationship with the merchant, despite maybe the stages not being completely appropriate given the context of this work, an adaptation of this model can be useful. As for the merchant strategies, those are ideas to be implemented as a result an interaction between the player and the merchant mixed with that merchant personality.

Lastly, the state-of-the-art architectures and models have mechanics and features that we will base our model on, being the one that fits better our necessities the CiF architecture. As we will see there is a great deal of inspiration taken from this architecture, some of the components share the same functionality with minor changes in order to fit better in the context of our work.

3 SOLUTION ARCHITECTURE: A MERCHANT MODEL

The model we propose focus on being generic, expandable, immersive and minimizing the authoring effort. Ideally, as a game developer, it should be enough to add this model into the merchant, specify its' traits, possible interactions (and their effects) the decision making and add the dialogue, to have a fully functional believable merchant. This merchant would have memory and a relationship state with each player character, according to its own traits and past interactions.

3.1 Model

A overview of the model can be seen in Fig.2, and in the following sections we describe its functionality and main components.

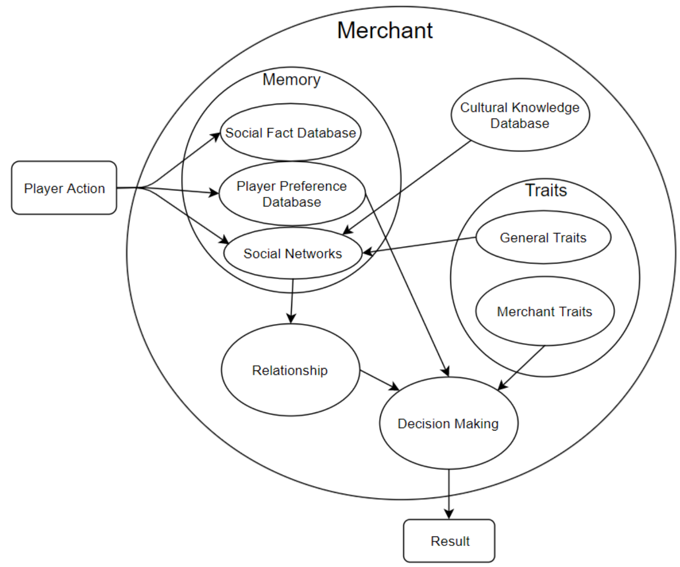

Figure 2: Overview of the merchant model

3.1.1 Memory. This component of the merchant is made of dynamic information and is separated in three different items:

- **The social fact database:**
  Responsible for saving the past interactions between the player and the merchant, these will serve as the representation of a long-term memory and allow for the merchant to judge an action not only based on the action itself, but also on the history between him and the player. It can also store interactions between the player and other characters.
- **Social networks:** Variables that correspond to how the merchant sees the player in terms of: Monetary Interest, Perception and Social Bond. Where the Perception can be seen as the opinion of the merchant based on what he knows of the player and the Social Bond as the the opinion that the merchant has of the player based on past interactions and the growth of the relationship between them. These are molded by the cultural knowledge database, the general traits, the social fact database and the action performed by the player in order to update the relationship between the player and the merchant.
- **Player preference database:** This is basically a list of items or actions that the merchant knows the player likes, for example, trough dialogue questions, the merchant may infer that

the player likes swords more than shields. That information is saved in the player preference database.

3.1.2 Cultural Knowledge Database. This component is populated by objects or actions that have a label attached to them that define how they are seen by the merchants. For example, a sword may be seen as a weapon, and that means that, for example, merchants who sell weapons will be more attracted to swords than merchants who sell herbs.

3.1.3 Traits. Fixed properties, unique to each merchant. They are the personality characteristics of the merchant and can affect the outcome in different ways. The traits can be divided into two types:

- General traits: Friendliness and grumpiness are examples of these traits. They affect the social networks values, making them weight on the decision of the relationship status.
- Merchant specific traits: Traits like greediness or the ability to make good deals, these affect more directly the decision making, not contributing for the alteration of the relationship but instead, affecting the prices the merchant is willing to accept as payment for different goals (for example).

3.1.4 Relationship. This component is responsible for keeping or updating the state of the relationship between the merchant and the player. The relationship is updated according to alterations in the social network values. These states may be of a more professional or personal nature. That is for the developer to determine.

The state of this component is responsible for affecting directly the decision making.

States may be reached when a certain condition dependent on the network values is found, for example, to reach the state X, the player might have to decrease substantially the values of monetary interest and social bond.

3.1.5 Decision Making. This is the last component of the model and it is responsible for determining, depending on the relationship state, the player preference database and the merchant specific traits, which will be the outcome interaction. This outcome can come in many forms, for example :

- A change in the shop content (for example the merchant can make available an item that was unavailable prior to this interaction)
- A sale or inflation of prices in the shop.
- A quest can be triggered.
- A simple dialogue option is played.
- A merchant technique is used.

The criteria itself for each outcome decision is up to the developer to make. The objective is to provide the tools to easily determine an outcome and the criteria for that outcome to be triggered. This would hopefully cut on the authoring effort.

3.2 Information-Flow

After the player performs an action that can be perceived by the merchant, that actions will be stored in the Social Facts Database.

Next, the Social Networks will suffer alterations according to the action performed, the social facts database, cultural knowledge database and the general traits of the merchant.

The newly updated Social networks will determine the relationship state between the player and the merchant.

Finally, the player preference database, the relationship state and the merchant specific traits will be taken into account in the decision making component in order to determine which will be the result of the interaction.

4 IMPLEMENTATION

The model was implemented as a mod with the tools given by the game Conan Exiles. This was done because it was relevant to test the model in a commercial game that fits the targeted genre of the model, in order for the test environment and conditions become closer to the proposed solution of this work.

Conan Exiles [7], is an open-world survival RPG, planned to be released in 2018. This means that, at the time of this work, the game was in early access, a state where the game is playable but still with frequent alterations and updates.

Figure 3: Screenshot of the game Conan Exiles

Conan Exiles has a modding tool called DevKit. This tool uses an altered instance of the Unreal Engine[8] in order to allow the player to have control over models, sound files, A.I, Unreal blueprints, maps and other components of the game.

There are some problems and limitations in this environment, the more prominent ones being: constant updates to the game and DevKit can crash the mods due to blueprints being overwritten. The DevKit allows just to access and alter blueprints, there are classes defined in C++ that are unaccessible to the user, not even to read. the user can call them though. Lastly, the lack of proper documentation can drag simple task longer than it should.

Due to these setbacks, the model implemented is an abbreviation of the proposed model. Despite this, the result does not compromise the objectives set in the section because we focused on creating the most relevant components and setting up a test environment that allow us to get the information we look for. The work tested can be seen as a base model for the proposed one.

4.1 Components

The components created for the implemented model have the same functionalities of the ones specified in the proposed model, but with some differences due to the limitations stated before and the engine we are working on. In this section we will present each component, focusing on the differences in relation to the one proposed

- **Interpreter:** This component takes into account several factors in order to update the relationship status between the player and the merchant. After updating the relationship status, it also updates the Social Fact Database.
- **Traits:** This component has no differences from the one in the theoretical model. It contains both the General Traits (characteristics that the NPC has as a person, influence the interpretation of the player action) and the Merchant Traits (traits are specific to merchants, directly the Decision Making component).
- **Memory:** This component is comprised of two others, the Social Fact Database, and the relationship status and it represents data that can be changed in runtime:
  - Social Fact Database: It's is the memory of past interactions, it saves the relationship status after each interaction in order to take that into account when interpreting an interaction and deciding the new relationship status.
  - Relationship Status: It is the value that translates into the relationship status, in this implementation, the value ranges between 0 and 10 being 0 the worst possible relationship and 10 being the best possible relationship.
- **Decision Maker:** This component is responsible for deciding an outcome based on the current relationship status and the merchant specific traits.

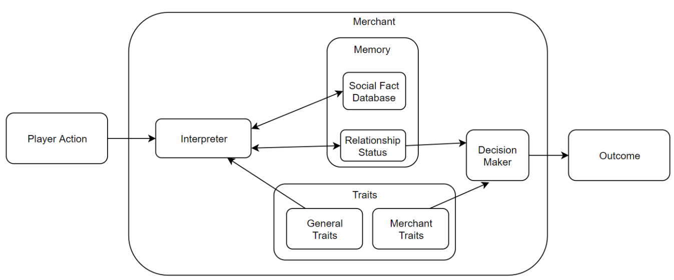

Figure 4: Implemented model

4.2 Shop

The merchants created with our model have the possibility of changing the properties of what they sell. We made the shop of each merchant dynamic, meaning that items can be added or removed from inventory, prices can go up or down and the amount of variance of the price can be determined aswell.

The merchant can change the shop as a result of interactions from the player and as a result of their own characteristics. For example: a 'nice' merchant can more easily lower prices and add new items to the shop, but the same merchant can be 'greedy', meaning that the discounts, despite happening easily, are very minor.

Parallel to that, we implemented another system similar, but without the dynamic properties, just so the player can offer items to the merchant. When interacting with the merchant, the player can reach a point where the merchant ask for a certain item, this works as a 'quest' type of action, to show that the model can support different interactions. Nonetheless, the system can be changed to work in different ways, like for example, having the player offer several items at any time. These actions can ultimately affect the relationship status between merchant and player.

4.3 A dialogue system model

The proposed merchant model presupposes the existence of a relatively advanced dialog system. While most RPGs already possess, Conan Exiles, being still in development as of the time of this work, lacks such a system. Here we present our dialogue system model, made to solve this problem.

Our solution for making a viable dialogue system had to guarantee that there were enough lines of dialogue to make the interactions with the merchant feel non-repetitive and that the lines reflected accurately not only the current interaction with the merchant, but also the relationship status between the player and him.

As such, we broke the dialogue system in two main types of dialogues, the ones that were not related to dialogue lines chosen by the player (we will treat them as reaction dialogues), and the ones that were.

4.3.1 Reaction Dialogues. To make the reaction dialogues, we set up a enumerator of possible actions (non-dialogue ones) done by the player, that justified an reaction from the merchant, for example, if the player punches the merchant, he may say a reaction dialogue line. These dialogues can be considered non-branching dialogues due to the fact that are triggered from an action but there is no direct interaction that the player can have with it.

4.3.2 Dialogue Tree. To make all the other dialogues (the ones that are part of a conversation, this means, branching dialogues) we used a system of five binary trees with height four. The nodes on each tree consist in an alternation between the player's chosen dialogue and the correspondent merchant response. After the player reaches the last node of a tree, the following tree is chosen according to the relationship status between the player and the merchant. If it is positive, then the player goes to the next positive tree, otherwise it goes to the next negative tree (as seen in Fig.5).

The last two trees (positive and negative) loop between each other or themselves, so, to try to avoid repetition of dialogue too much. Each player interaction has three possible (and identical in meaning) merchant answers, so that if the player goes to the same tree two times in a row, it doesn't feel too repetitive.

Another feature we added was to integrate small quests in order to go from the first tree to the second and from the second to the third. The quests consisted on the merchant mentioning that he wanted a certain item, and the player had to offer that item to the merchant to be able to continue talking to him. We did this because it incentives exploration, it makes the interactions with the merchant last longer, and to show how small quests can be integrated with the dialogue system and can work as extra good or bad actions in the model we created. Despite being relatively simple, it proves that there is room to seamlessly integrate another type of interaction with the dialogue (the full set of dialogue trees done for each merchant in this work can be seen in Fig. 6).

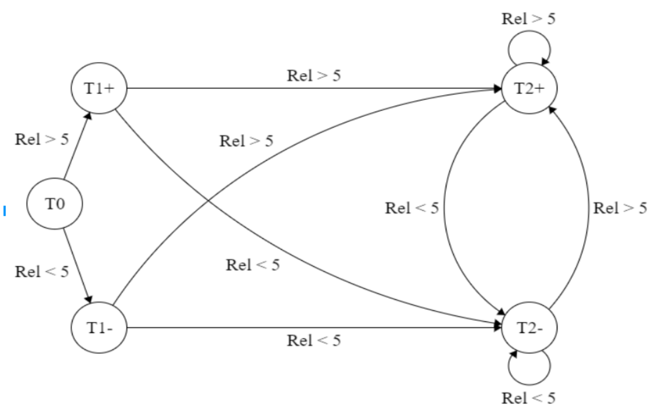

Figure 5: State machine of the dialogue tree system, where the criteria of the tree selection is the relationship value being above or below 5 (this value is customizable)

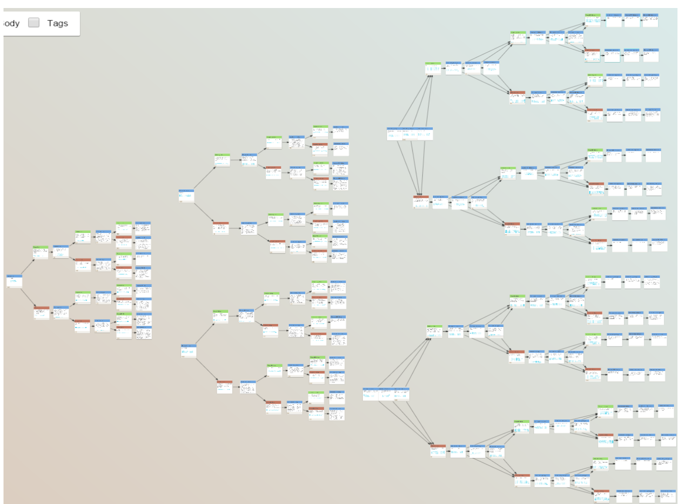

Figure 6: Full set of dialogue trees existent in our particular implementation

5 VALIDATION

The validation process consisted on having each participant testing three scenarios, where the only difference between them was the merchant that was present. After each playing trough each scenario, a questionnaire was given to the participants relative to the merchant present in said scenario.

The scenario given to each participant required them to buy a certain item from the merchant, the item could be bough with materials gathered in the world or with other items that the merchant sold as well. The participants had 15 minutes to perform that goal.

The three merchants created for this tests had different characteristics and, are identified here as:

- Basic: This merchant lacked our model, this means that, upon interacting with him, the player would be presented with a simple greetings message and the shop would pop-up with the items available with average prices (relative to the other merchants). This merchant is used as a representation of the average current merchants present in video-games and it serves as the baseline of our interpretation of the results.
- Good: Has the general trait 'sympathy' with a high value and the merchant trait 'greediness' with a low value. Also, the shop of this merchant starts with some items locked, only becoming available after the player and the merchant reach a certain value of relationship. Also, the merchant makes requests to the player as he explores the dialogue tree with him. This prompts sub.goals where the player has to offer certain items to the merchant in order to be able to progress along the dialogue tree.
- Bad: Has the same characteristics as the Good merchant, but the values of sympathy are low and the values of greediness are high.

The tests involved 24 participants, with the order in which they experienced the merchants rotating so that each possible combination has the same amount of results.

Having different merchants with our model guarantees that the player has different experiences that can make reaching the objective an easier or harder task when compared with the basic merchant which is, as previously stated, the baseline for our comparisons, because:

- when dealing with the Good merchant, the player can finish the objective faster due to this merchant easily developing a positive relationship with the player (product of having a high value of sympathy) and, when lowering the prices, the deals are very favorable for the player (because it has a low value of greediness)
- when interacting with the Bad merchant, the player is presented with a harder challenge because it is difficult to increase the relationship value and easy to decrease it and, even when the player manages to reach a point where the merchant cuts the prices, these cuts are lower than the ones made by the nicer merchant.

With this settings it is also possible to test if the proposed model allows for varied player experiences with minimal authoring effort. As we mentioned before, we gave the merchants (that had our model) the possibility to ask for items when the player finished one dialogue tree. This had the objective of incentivising exploration and elongate the experience. The items asked could be found near the merchant location and the merchant would remind the player of this quest and point out to the locations of said items every time the player interacted with him while he was waiting for quest to be completed.

5.1 Results

There were two types of questionnaires given to the testers, one type after each player interacted with each merchant (referring to said merchant), and one after all interactions (referring to the experience as a whole).

The questions asked were taken from several published questionnaires, from which we had to let go part of them because they didn't fit the context of the experiment. In total, nineteen questions were made regarding each merchant. A seven point Likert scale was used to measure all of them.

Regarding the questionnaire given after all the interactions, it had seven questions, the first five being also with a seven point Likert scale, and the last two being of multiple choice (single answer). This questionnaire had questions regarding the experience as a whole, with the two last questions being about the personal favorite merchant and the one the participants felt it could enrich more the game.

From the answers to the questionnaires about the merchants, we were able to create 3 groups to be evaluated: Enjoyment [21], Engagement [26] and Believability [20] [9].

Each of these groups are comprised of a selection of questions that, for each of the merchants, have a Cronbach's alpha value of at least 0.65 and below 0.95, this ensures that, given the number of tests and questions there is an acceptable inter-relatedness between questions, while avoiding redundancy (product of an high Cronbach alpha value) [28].

The questions contained in each group were the following:

- Enjoyment:
  - I found interacting with the merchant enjoyable.
  - I had fun interacting with the merchant.
  - Given the chance, I would interact with this merchant again.
- Engagement:
  - The interaction was engaging.
  - The interaction with the merchant caused real feelings and emotions.
- Believability
  - It is easy to understand what the merchant is thinking about.
  - The merchant has personality.
  - The merchant behavior draws my attention.
  - The merchant behavior is coherent.
  - The merchant behavior changes according to the interaction
  - The merchant is believable.

We also took into account two questions that didn't fit any group, but were relevant to our interpretation of the results. Those questions were:

- The interactions with the merchant ran fluidly and smoothly.
- The merchant behavior is repetitive.

The results gathered help validate our hypothesis, stated in the introduction section, that a merchant with a more deep social component and believability could improve the player experience and engagement, without compromising the flow of the game.

The analysis consisted of calculating the means of each group results and, due to the nature of the tests (nonparametric and paired), run the Wilcoxon signed-rank test, to show the levels of significance between the basic merchant and the good merchant and between the basic merchant and the bad merchant.

From the results shown in figures 7 and 9, we can observe that:

- The participants had significantly higher ($p << 0.01$) levels of enjoyment when interacting with either the good or bad merchant in relation to the basic merchant. We assume that this is mostly due to the higher range of interactions and reactions that exist in the non-basic merchants.
- Non-basic merchants are significantly more believable and engaging than the basic one. The means of the believability and engagement values are very high in both merchants that have the model implemented, and very low in the basic merchant.

The questions about the flow and repetitiveness of the interactions also presented positive results fig.8, fig.10, showing that there was no significant different in terms of flow and functionality between the merchant without the model and the merchants with the model despite the increase in complexity. Also, regarding repetitiveness, results show that the merchants with our model implemented are

Enjoyment	Mean	Median	Std. Deviation
Basic	2.88	3	1.36
Good	6.29	6.17	0.62
Bad	6.07	6.17	1.12

Enjoyment	z	p
Good - Basic	-4.199	0.00003
Bad - Basic	-4.123	0.00004

Engagement	Mean	Median	Std. Deviation
Basic	1.79	1.5	0.91
Good	5.85	6	0.92
Bad	5.83	6	1.12

Engagement	z	p
Good - Basic	-4.297	0.00002
Bad - Basic	-4.293	0.00002

Believability	Mean	Median	Std. Deviation
Basic	2.76	2.67	0.82
Good	6.06	6.17	0.58
Bad	5.95	6	0.76

Believability	z	p
Good - Basic	-4.288	0.00002
Bad - Basic	-4.287	0.00002

Figure 7

Repetitive	Mean	Std. Deviation
Basic	6.38	1.41
Good	3.33	1.37
Bad	3.5	1.44

Repetitive	z	p
Good - Basic	-3.916	0.0009
Bad - Basic	-3.822	0.00013

Flow	Mean	Std. Deviation
Basic	5.13	1.36
Good	6.13	1.03
Bad	6.13	1.12

Flow	z	p
Good - Basic	-2.245	0.025
Bad - Basic	-2.225	0.026

Figure 8

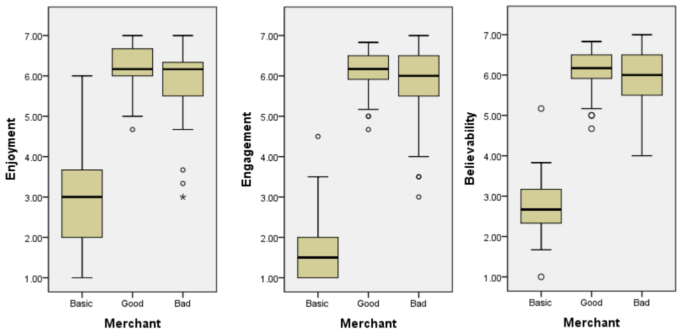

Figure 9

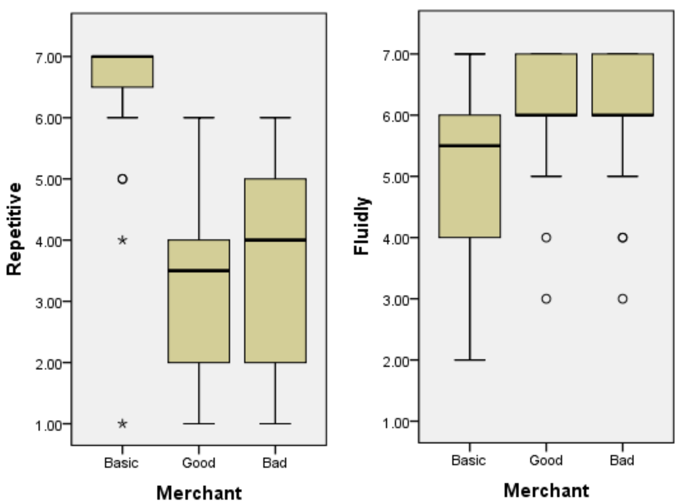

Figure 10

considerate significantly less repetitive when compared with the one without the model.

The questions made after all interactions lead us to believe that the features implemented to the merchant (specifically the fact that his inventory is dynamic and the possibility for him to give quests) were well received. Finally, the two last questions that asked which was the personal favorite merchant of each participant and the merchant that each participant thought it would fit better in a Role Playing Game fig.(11). From these results we can see that, for both questions, a great majority of the participants prefer merchants with our model implemented, with the interesting fact that the players, despite preferring the nicest merchant, though that the more antipathic one was a better fit for the game.

6 CONCLUSIONS

In this work, we proposed to tackle some limitations in current video games. The fact that, in a big majority of games, the NPCs that have the role of merchants, do not have any kind of engagement with the player, they feel like a tool to implement a trading mechanic, and not a character with a personality and social characteristics.

Other problem recognized was that associated with NPC with any depth, there is a lot of authoring behind it.

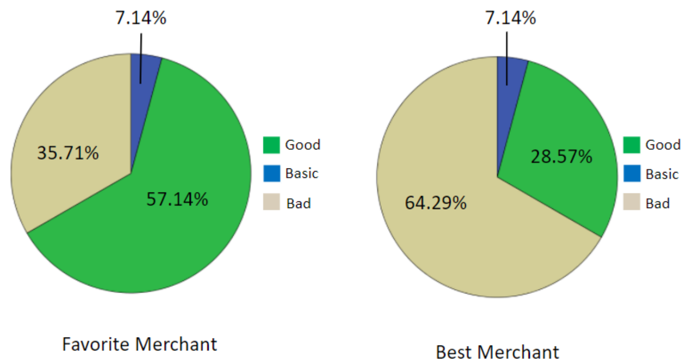

Figure 11

With this in mind, we developed a model that aims to solve or minimize of those problems, specifically in NPCs that serve as merchants.

The model had to fulfill some requirements. It had to be generic enough to be possible to implement in a variety of games, it had to reduce the authoring effort (when compared with the creation of a social NPC with the same characteristics has the ones we want to make) and it had to improve the believably of the character and overall player experience.

The model was implemented using the Conan Exiles DevKit, that is a modified version of the Unreal Engine.

According to the results of the tests done, 93% of the players showed preference of the merchants with the model implemented when compared with the merchant without the model. On the same note, when questioned about the enjoyment and believability, the preference for the merchants with the model was very significant. Another accomplishment was the fact that, according to the results, the model implemented did not compromise the flow of the interaction between the player and the merchant and that it was possible to create two distinct merchants with very little authoring effort.

The outcome of this work show very promising results, it is worth to dedicate more resources in this area, because a lot of times it's pushed aside when developing a video-game, but it is proven that with some investment it has the potential to improve substantially the experience of the player when playing the game.

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