

# Alexa What Have You Done?

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## Abstract

The Mystery Genre revolves around a search, either for an answer or, in the case of video games, the resolution of a puzzle. The author places clues that are ambiguous and lead the player in the wrong direction, still so obvious that once they see the answer every clue fits. The Virtual Suspect is an interactive agent that has an interesting property, it can lie. In this work, we use the existing Virtual Suspect Response Model to create a mystery game, utilizing the lying mechanic to create an engaging voice game. We created and adapted a story for the Virtual Suspect, improving its experience to be able to create an engaging game. Through collecting feedback and data from a User Study we understood the impact of our design ideas and changes to the original project.

**Keywords:** Game Design; Storytelling; Mystery Games; Virtual Suspect; Amazon Alexa

## 1. Introduction

The Mystery Genre revolves around a search, either for an answer or, in the case of video games, the resolution of a puzzle. The author places clues that are ambiguous and lead the player in the wrong direction still so obvious that once they see the answer every clue fits.

Interactive Agents are a useful teaching tool and are often used for that purpose. Because they are less expensive, more accessible and offer an increased control of the environment it is a safe approach for training specific skills in professional environments. The Virtual Suspect is an interactive agent that has an interesting property, it can lie.

Combining the realism of an interactive agent with the video game media is an ever-growing concept that companies like Amazon are investing greatly.

### 1.1. Motivation

Introducing an interactive agent capable of lying to a game is a challenge, but also a great opportunity as it gives the player agency. Though, it has its challenges. We have to understand how to design a game around it, incorporating the Virtual Suspect in a natural way that does not take the player out of the experience whilst creating a good Mystery game. If this combination is well developed the experience on a whole will improve. Considering the Virtual Suspect offers a believable suspect where instead of a streamlined dialogue, it provides a realistic dialogue where the player can ask and say anything whilst always been given a nat-

ural response, creating an immersive experience that if done right can maximize the Mystery Game experience. Rato et al.[8] built the lying Virtual Suspect and Baptista et al.[1] improved the model interaction, with the objective of improving the main limitation of Rato's model, the interaction through multiple-choice selection. Using this last iteration, we can develop a game using it, considering the limitations around integrating a model that worked by itself to a Mystery Game, that has as its main focus to engage the player.

### 1.2. Problem

The problem encountered is creating an engaging game that uses the Virtual Suspect in a natural way, using its strengths to improve the mystery game genre, for this we have to study both the weaknesses and strengths of this system and create an engaging way to interact with it.

### 1.3. Objective

The objective of this work is to create an engaging and interactive game using the existing Virtual Suspect model developed by Rato et al. [8] with the interface improvements developed by Baptista et al. [1]. We want to use the lying capabilities as a game mechanic, having a spoken natural language conversation, to mimic an actual investigation.

With that objective, we will use Amazon Alexa and its services. Developed by Amazon, Alexa is a virtual assistant capable of voice interaction. We will use Skills, which is the feature that allows the creation of third-party apps, provided for free by

Amazon.

The goal of this work is for the player to be able to use the natural language conversation with the virtual Suspect, in which he can ask questions related to the investigation, to solve the case. Additionally, after the game experience is created, we would like to improve the system both in interaction and in character depth, to improve the game experience.

## 2. Related Work

As research for our work, we looked at several other works with relation to ours.

We discussed other works that were relevant to our own. We explored *Storytelling* in general and in Video Games, we looked through *Narrative Techniques* [6], the *Mystery Genre* [12] and *Dialogue and Detective Games* [2, 3] to understand how to achieve our goal, we looked at how *Voice Games are part of the future of gaming* [11] to understand what this medium can bring to Video Games, and finally we explored the game *Her Story* [4] which was the main inspiration for our work.

## 3. Virtual Suspect

The purpose of this section is to describe the current state of the Virtual Suspect project we will use and improve in our work, developed by Rato et al.[7] and continued by Baptista et al.[1] in their respective master's Thesis. We will focus on Baptista's iteration as it is more interaction centred.

### 3.1. Story Representation

The Virtual Suspect has an internal memory of everything that happens in the story. The story consists of a collection of events, each containing entities.

The Agent keeps a timeline of all the actual events (what actually happened), also keeping a timeline of what he tells the interrogator, keeping the lies he manufactured, and most importantly where he omitted the incriminatory details. An entity is defined by the tuple (Identifier; Type; Value).

These entities are added before the interaction starts, and cannot be deleted after being stored in the agent's memory. They can be associated and unlinked with events after.

A flexible frame represents an event as an association of multiple entities, without many constraints, and an action. These way, the author can create a narrative with freedom, whilst also holding the semantics needed for the agent to create alternative stories. An event is defined by the tuple (Identifier; Real; Incriminatory; Action; Time; Location; Agent; Theme; Reason; Manner).

The **Real** and **Incrimatory** elements are unique to the rest, because they describe the event instead of describing the event's content. These

two fields are assigned by the author when creating the story, although if they are generated by the agent, the **Real** value will be *false* without exception and the **Incrimatory** value will be calculated in function of the entities' values.

The author can add events to the story that are *false* with the objective of influencing the agent's process to create an alternative event.

The original story is created by the author before the interaction starts, the content will not be modified during the conversation and its events are persistent, these events will never be deleted.

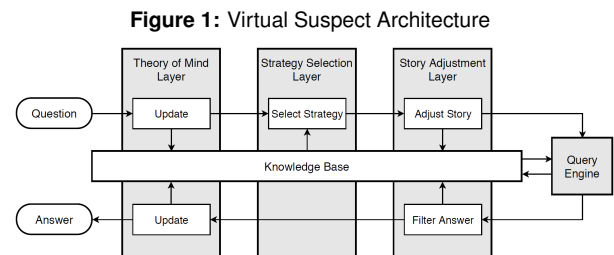
The parallel story will be greatly modified during the conversation, events will be created, modified and swapped. The agent will gather new information about the user's knowledge, being stored in a collection of tuples (*Entity; Event; Known*).

To create the story, the author specifies the real sequence of events, identifying the compromising information and then uploads it to the agent's memory.

### 3.2. The State of the Interaction

The purpose of Baptista's iteration was to improve how the user interacts with the Virtual Suspect. Since one of the great steps in this improvement was the incorporation of Amazon's Alexa we will explore how Alexa's introduction improved the interaction.

**The Interaction Model** changed a lot since Rato's iteration, some of these changes were in service of other improvements, but this were the changes concentrated on just the Interaction Model. In figure 1 we show the current Virtual Suspect Architecture.



Namely, new *intents* were added, some simple ("Hello" for Greeting, "How are you?" for Introspection) and the rest were in service of the new types of question: Action Focus questions, Knowledge questions and Manner Focus questions. Here is a brief explanation of each of this questions:

- **Action Focus Questions:** Retrieves the Action field from an event. Works in a similar manner to the existing focuses in Rato et al.[8] iteration. For example, questions like "What

*were you doing on November 7th at 2am?*” is a Action Focus Question.

- **Knowledge Questions:** Information regarding a specific *entity* rather than an *event*. For example, questions like “Who is Luke?” “How do you know Miss White?”, or “What key?” are knowledge questions.
- **Manner Focus Question:** Information regarding how something happened (in what manner). For example “How did you meet James?” or “How did Jesse find the key?”.

A lot more *utterances* were added, one particular aspect to note are the questions with Time slots, since the team had to add a lot more different combination to cover for more possibilities.

In the *slot values*, more synonyms were added to the different slot values, adding also possible nouns that represent the individual slot.

Before diving into the Alexa additions it is important to understand how a user asks a question to Alexa, quoting Baptista et al. [1]:

*“The user asks Alexa a question, which is interpreted by the **Interaction Model**, which sends a **Skill Request** to the **Skill Service**, which transforms it into a query and sends it to the **Virtual Suspect Response Model**, which computes the query results, sends it to the **Natural Language Generator**, which then sends the answer back to the **Skill Service** so it can be transmitted back to the user.”*

About the **Skill Service** additions, a lot of filters were added to safeguard the users from going astray and to improve the experience. For example, a filter was added to check if an answer does not contain any results and generate a simple answer in return, in the case of a question with a time focus, “Never”.

To increase the realism of the agent other changes were added, the addition of *Context and Pronoun* functionality, where a record of the context was stored to support direct pronoun and contextual questions, this was a great step in making the interaction flow better. Other changes with this goal were, the ability to use times of day during a conversation and support for the new intents, the Greeting, Introspection and Thanks (which are self explanatory).

An important change was the decision to give better **feedback** to the user, in case of any of the steps going wrong, for example explaining that a word is not recognized or that a question does not contain enough information, the user can readjust their question so to be better understood by the agent.

These new changes are important to use the Virtual Suspect as a mechanic in our game.

### 3.3. Limitations

Through Baptista’s work the team managed to make many changes and improvements to the interaction with the Virtual Suspect, still there are constraints that limited the further improvement of the interaction. These constraints were centered around the Alexa Skills Kit and the structure of the Interaction Model, the organization of the agent’s memory and the Virtual Suspect Architecture, and the implementation of the lying algorithm.

The **Alexa Skills Kit** is strong at building simple skills with specific functions and more limited domains, unfortunately the interaction of the Virtual Suspect is more conversational, requiring more nuance. A more non-deterministic, grammar-like approach could be beneficial for improving the interaction. According to Baptista, a solution where there could have been a better understanding and control of the selection process would have lead to a better interaction.

In terms of the **Virtual Suspect Architecture**, Baptista describes the limitations more in terms of what the user expects versus what the machine offers. For example if the agent is capable of understanding certain questions very well, the users expect it to understand other questions that are, in the eyes of a human, just as complex. Unfortunately the way that the agent’s memory is structured, and the kinds of questions it can answer, do not always correspond to the users expectations. Quoting Baptista: *“All these limitations and the way that the agent’s memory is structured makes it impossible to write a realistic story”*, although if the memory was restructured so that events could be organized in a timeline, and reasons and motives reworked, it would facilitate the creation of a more believable story.

Regarding the **Lying Algorithm**, because Baptista’s objective was to improve the interaction, the lying algorithm was not changed. Currently the lying algorithm works by *creating new fake events to substitute Incriminatory events, keeping the action and replacing the entities that have not been marked as known. Selecting new entities by searching through all entities and then identifying the most similar ones.*

Concerning the **Story Creation**, the system is quite obtuse, being really hard to adapt a original story to the system, the only way to make this step a bit easier is to plan every part of the story as well as possible. It would be a considerable improvement to facilitate this process.

A problem to take into account is that the entities described before have to be updated in the Skill Developer Console, which complicates the **Story Creation** further.

#### 4. Game Design and Story

An important step in game making is to document your initial objectives and ideas for the gameplay, With the objective of keeping a consistent image of what the developers want to achieve throughout production.

##### 4.1. Gameplay

The main gameplay idea is interrogating a character, through this the player is able to grasp the plot and understand if the narrative given by the agent is real. We will focus on making a coherent voice game, whilst giving the players an immersive experience of embodying a detective investigating a crime.

Like the game *Her Story*, we intend to give the players an unique experience where *control will be surrendered* to the players, giving them only enough information to play the game, and letting them explore at their own pace, and an important aspect, present in *Her Story* that we want to explore, is not giving an ending to the game, letting the players choose when they have enough information to end their story.

##### 4.2. Mechanics

**Talking** is the main mechanic, using Virtual Suspect previous work, we can have a semi natural conversation with characters. The experience the Virtual Suspect offers at this moment is a semi natural conversation, where the players can ask anything they desire, but if the system doesn't recognize that question it will give a pre-made answer that shows the player the question is not recognized by the system, giving the option of rephrasing or move on.

**The lying mechanic** is fundamental for the game to work, right now we can define what the suspect lies about. To achieve the planned gameplay, we have to use this mechanic in a smart way, defining the lies whilst planning the story so as to create a coherent story and experience. It is important to also take into account that this mechanic has another facet, which is the **Incrimination** value, that represents how compromising the event is, we can consider this still the lying mechanic, having to be careful when giving these values to each event.

##### 4.3. Story

Our story is based on the book by Agatha Christie "*Peril at End House*", being a work of Detective Fiction we think it's the perfect reference for our story. The greatness of Agatha Christie's work is the mystery surrounding each case. In the *Peril at End house* the objective is reversed, Poirot (the main character of the story) has to discover who the culprit is before the crime happens, the big plot

twist of the book is that nobody is trying to kill Nick (the woman who claims someone is trying to kill her), the truth is that Nick created this plot to get the inheritance of Michael (a rich friend of Nick). We think this is a perfect idea for our story as the game focuses on interrogating a suspect capable of lying.

Understanding the main idea of our reference we can begin to create our story, taking into account that the player enters the story after the events have happened, which constricts us, but if done right allows for a unique experience.

The story starts when **Joanna Brando** and **Sarah Weisz** lose the house where they live together, and their friend **Alex Larsson** invites them to live in his manor, right outside of their town **Nomansland**. Although Joanna likes her friend Sarah, she always was envious of her, not because Sarah provoked this envy, because Sarah had everything Joanna wanted, starting with loving parents, and a degree in fashion design that Joanna couldn't accomplish, because, as Joanna says, she isn't good at the studying business. But now she had the opportunity to have something that Sarah does not have, a rich beautiful husband, and her work was cut out for her, she already was living with a man like that, Alex an accomplished military pilot with a great family inheritance. So Joanna starts making her moves, whilst Sarah is just friendly and thankful towards Alex, she thinks she is winning him little by little.

Although Joanna plans to marry Alex eventually, she still likes to live her nightlife, going out until the late hours of the day, taking every designer drug she can have. She does not do all this alone, she has her trusty school friend, **Christian Speedwagon**, an artist without a job, that makes ends meet by selling the aforementioned designer drugs and other substances, which is amazing for Joanna as he is so kind as to offer her as much as she wants in exchange for company and a strong relationship, this deal was never discussed or mentioned out loud but Joanna believes that if she stopped going out so many times a week suddenly Chris would not be so kind to her.

As time passes the three housemates become closer, Joanna's friendship with Sarah is as tight as it has ever been, Sarah and Alex enjoy having company when they wake up early in the morning, and when Alex is called up for his military service, he believes Sarah is responsible enough to keep his manor safe, and lastly, Joanna feels like she is really close to her goal, making Alex fall for her and finally marry him.

It was all going according to plan, until the fateful night when Joanna decided to go out with Christian once again to **End House's Envy**, the famous

Nomansland's discotheque. This night in specific Chris had a great amount of "stock" to sell so he was consuming a lot, whilst selling as much as he could, and Joanna was consuming just as much as him. By the end of the night, Chris decided to make a move on Joanna, and Joanna was so consumed by what she took, she didn't think about the consequences of her actions, accepting Chris' idea.

To keep it short Joanna woke up the next day in Christian's flat a long time after tea time, and panicked and took a taxi home. When she arrived home she finally discovered what was truly developing in Alex's manor, Sarah and Alex embraced her and shouted as loud, as they could, that they just got married, but they were only telling her because they didn't want to deal with all the attention Alex would get as was a known person in the town. Joanna was flabbergasted, confused and angry, but she couldn't show it so she just said "congratulations my dear friends, I am so happy for you", but deep inside she raged as Sarah finally got everything Joanna ever wanted.

Joanna had thought of killing her friend before, foolish thoughts, she said to herself she would never do something like that to her dear friend it was just nonsense her brain created to deal with the envy. But this time she lost all reasons to not do it, in her head this was a personal attack against her, destroying her life. She found that the only recorded proof of their marriage was a simple paper that she knew Chris could forge one exactly the same with her name instead of Sarah's. So she conceived the full plan, created the concept that someone is trying to kill her, and make Chris kill Sarah somehow and later kill Alex, to receive the enormous inheritance of her beloved husband, it was so simple nobody had any idea that they got married.

So she threatened Chris with calling the cops on him as she knew every transaction he had ever done, to which, Chris accepted as easily as she thought he would, being a paranoid addict with little to lose. After having Sarah's executor she needed a way to get rid of her, so she spiked her own food with cocaine which created a strong reaction, that she knew wouldn't be fatal, Sarah quickly drove her to the hospital as planned whilst Sarah waited for her best friend, Chris cut her breaks. Joanna waited for Chris' signal before asking Sarah to go sleep in the manor, as Alex was out in the war, fighting for the British army, Sarah accepted the idea and went home but never arriving as she died in a so-called accident.

Part one of her plan was done, now she had to think of a way to get rid of Alex right as soon as he arrived, but now she didn't have Chris as he ran away as soon as he understood Sarah had actually

died. As she was stressing not figuring a way to get rid of him, she received a call.

Her luck was finally changing, Alex Larsson, had died in the war, the plan was complete.

The interrogation starts the week after Alex Larsson was found Killed in Action.

#### 4.4. Characters Description

**The Detective:** The player, an empty shell, no description necessary.

**Joanna Brando:** Someone wants to murder her, at least according to Joanna. Joanna is young in her late twenties, comes from a dubious family, where the father died whilst she was young, and the mother died recently, having Joanna inherit the little she had.

Joanna lives in the house of a friend, a mansion that her friend Alex inherited when both of his parents died in a plane crash, because Alex hates to be alone he invited both Joanna and her friend Sarah to live with him rent free.

165cm, slim, a classic eye candy character.

**Alex Larsson:** Is in his early thirties, a pilot for the military, rich and successful at the right age to start a family.

Alex lives with his friends Joanna and Sarah, he is really close with both, Joanna mentions that Alex and her relationship became quite close whilst living together, ending up marrying her.

Alex was killed in action, fighting for the British army.

175cm, muscular, a gentleman through and through.

**Sarah Weisz:** Is young in the beginning of her late twenties, had a happy childhood where both her parents showed affection and encouraged her dream to be a fashion designer.

Died recently in a car crash after driving Joanna to the police station, police suspect no foul play. This event made Joanna more paranoid, as she believes she was supposed to die instead of Sarah.

168cm, a tall and strong woman.

**Christian Speedwagon:** A friend of Joanna, from the art world, even though he does not have a job he lives comfortably, the police suspect he sells some kind of stimulant but have not caught him with anything or in the action of selling yet. Christian seems close to Joanna, but even though Joanna says Sarah was a good friend of Christian, there is no evidence of that, on the contrary it seems like they did not get along at all.

165cm, a small man, with little weight on him.

#### 4.5. Gameplay Progression

Through the introduction of the game, a small text when the game is opened, the players learn that there are four characters involved, one of them being the agent they will interrogate, the rest being

the characters that participated in the story. In addition they learn the plot of the story (Someone is trying to kill Joanna), and finally they are taught what questions the agent understands, starting with “who is...?”, which drives the player to ask who each character is.

Through asking who each character is, the players understand that Sarah died in a weird accident, Alex died whilst fighting for the British military, and Christian is missing, this is where the player will start thinking about Chris as a possible suspect. Some other elements of the story are presented here, what each character does for a living and small hints that Sarah has more success in life than Joanna, and finally that Joanna is married with Chris.

Now that the players know who each character is they now have an interest in knowing more, which they can through asking where each character lives, which will mention important places, like the city “Nomansland”, “Alex’s Manor”, and “Christian’s Flat”.

The next tip the players are given is to ask about Joanna’s relationship with each character, giving the player a bit more context about the characters dynamics, showing that Joanna really cared about Sarah but giving a small hint that Joanna is being ironic and corny, cementing the idea there was a marriage between Joanna and Alex, and finally that Christian has been weird lately.

From this point onwards the player starts gathering information about specific events, like the wedding, Sarah’s death and Alex’s death, which to an attentive player will create inconsistencies in Joanna’s story.

The rest of the game is up to the players, trying to match dates, trying to get Joanna to tell the truth and finally understanding that Joanna was the mastermind behind the events.

In figure 2 we can see the gameplay loop we intend to achieve, which consists on giving the players enough information to be able to explore freely the events and characters that consist the story.

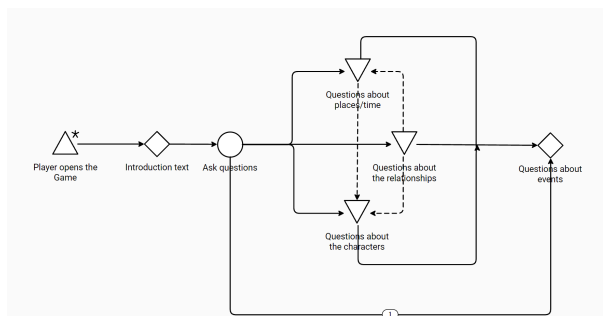


Figure 2: Gameplay Loop

## 5. Development

In order to accomplish our goal we have to adapt the story we created into the format the Virtual Suspect accepts.

### 5.1. The Format Accepted

To Adapt the story created we have to break down everything to the format the Virtual Suspect accepts. First we have to think about the entities (*Identifier; Real; Incriminatory; Action; Time; Location; Agent; Theme; Reason; Manner*) that define an event.

These entities are later used to describe the events, it is important to mention that each one of these has a unique *speech*, which is a phrase the agent will say if triggered, We will influence the player through each of these interactions.

After finishing the previously described entities, we can start creating the events. The events have a predetermined format with optional additions, (*Identifier; Real; Incriminatory; Action*), the previously described entities being the optional additions.

### 5.2. The Adaptation

Having all this in mind we can start deconstructing the story into the format described. As mentioned before, we have to start by giving the agent the entities that we will later use in the events.

After defining these entities we can finally make the events, remembering that these entities are pivotal for the events to work and be interactable. To make this adaptation, we have to think of the story as checkpoints, where at a certain *time*, in a certain *location*, for a certain *reason*, etc., an event happened. These entities mentioned are what make this event a part of the story given to the agent. In figure 3 we can see an example of an event, that regards the marriage between Joanna Brando and Alex Larsson, a fake event.

<b>ID:</b> 10
<b>Real:</b> False
<b>Incriminary:</b> 0
<b>Action:</b> Marry Alex
<b>Location:</b> Alex’s Manor
<b>Agent:</b> Joanna Brando
<b>Subject:</b> Alex Larsson
<b>Reason:</b> Marry Alex
<b>Theme:</b> Marriage

Figure 3: Event Example

### 5.3. Prototype

The prototype was created to finally test with players, having integrated our design ideas and im-

proved the Virtual Suspect we were ready to have feedback to understand what went well and what is still missing from the Virtual Suspect tool in order to be able to host a full game experience.

Two informal user tests were conducted before implementing the extended responses, improving the slot types synonyms and fixing story inconsistencies, the tests took on average 30 minutes. These user tests had the objective of understanding how the tool was functioning with a different perspective than the developer's. From these tests we learned that it was hard to interact with the agent as the entities were still underdeveloped adding that the agents responses were still basic answers it was hard to flow through the story without getting lost. We could conclude there were still properties to improve by letting the two players play with little direction, and in the end having a conversation about what they thought was still missing in the experience.

To give the players the option to talk with the agent in any way they intended we exported the game to Alexa mobile, however all the players who tried the prototype through this system, mentioned that it was easy to get lost and thought it was more convenient to play on the personal computer. The only way a version using Alexa Mobile would work in a similar fashion to the developer console would be to use *Multimodal Responses*, which are an addition of other forms of communication, like adding visuals as a secondary aid, which in our case would be a transcript of the conversation so the player can read the answer given by the Agent, this would be interesting to add in the future as it would improve the user experience of the game.

### 5.3.1 User Study

With all the changes fully implemented, it was time to conduct a User Study and verify if they improved the experience and delivered an interesting and concise mystery game. Even though the interaction could be improved even more, we think it is time to get feedback on our work and try to understand what can be done in the future to further improve the experience.

Our hypothesis was that these improvements to the story and overall adjustments would improve the experience and deliver a coherent game experience. Our procedure and findings can be found in chapter ??.

### 5.3.2 Last Adjustments

The last adjustments we made after the User Studies were:

- We fixed some bugs that were making the

game crash, most had to do with the Alexa side of things where some slot types were giving the system trouble, these issues were both because a minor difference in the entity text in the *XML* would automatically make that slot type to stop functioning and because of the order of the entities in the *XML* file being wrong;

- Created a lot of synonyms for all intents so the player can ask the questions in a more natural way, great examples of this are "Christian Speedwagon" having the synonym "Chris", in the action slot types giving the events synonyms to facilitate the questions, like the event "Go to a Doctor appointment" having the synonyms "go to the doctor" and "go to an appointment", and the theme "Started living in Alex's Manor" has multiple synonyms to facilitate the conversation, like "Started living together with Sarah and Alex", "Started living together with Alex and Sarah", "Started living together", and "You and Sarah start living with alex" which gives options to the player and avoids the agent not understanding minor differences in the dialogue;
- Fixed story inconsistencies that were found by the players, in the same vein adjusted some events incriminatory setting as the agent chose to respond inconsistent answers which confused the players;
- Fixed dialogue mistakes that went from spelling to missing exposition properties;
- Fixed the initial introduction to give players more information on what questions the system prefers so there is less probability of unsuccessful questions, adding "*who is ...; Where was ...; when was ..., what is your relationship with ...*" so the player has some idea of where to start questioning the agent.

These changes improved both the quality of the project and the game experience.

You can find the project at: "<https://git.io/JPr05>"

## 6. User Study

Having concluded the development of this work, we carried a user study. The test was at the end of the development cycle, having the purpose of validating the improvements and design choices made for the game using the Virtual Suspect, whilst also having the purpose of identifying the shortcomings and areas of improvement for future work, for example having the lying component integrated it served to see how the testers reacted to the lies present.

The main objective of this User Test was to validate and understand if the improvements and design choices came to fruition and had the impact desired, this choices are giving the player complete freedom to explore the story at their own pace, and having the main character be an unreliable narrator, which the player is not told having to find out by themselves.

The changes made to the story of the Virtual Suspect improved how the player receives knowledge and exposition, making it easier to flow through the story. The method of interaction consisted on supervised User Testing, where the tester would play the game whilst being supervised by the researcher the tester could ask questions regarding errors or anomalies but not about the story, preserving the freedom intended in the game.

Our study sample comprised of **14** participants. Of these 14, **11** participants identified as **male** (78.6%) and **3** participants identified as **female** (21.4%). Although the **14** participants were non-native English speakers, the levels of *comfort with the English language* were high, with **8** participants (57.1%) responding 7, the highest value, and **5** participants (35.7%) responding 6 the second highest value, leaving **1** participant that responded 5, which is still a relatively high value. We can conclude that our sample was comfortable with the English language, 92.8% responding **6 or higher**.

We learned that the game succeeded in many aspects, in particular it made the players *feel like a detective* and gave them a sense of *agency* and impact on the plot. The downside of giving total freedom to the player is having to cover almost every single way the player might interact with the agent, after analysing the results we can see that it is extremely important to improve the interaction in order to improve the user experience and immersion.

Continuing the thought of the need to improve the interaction, we saw in more detail what the agent still lacks in **The Virtual Suspect** section. The biggest problem with the agent at this moment is the small sample of questions it understands, creating a challenge for the players to interact with it how they really want. The positives to take are the novelty and immersion the agent creates. If the interaction can be improved this positives will become even more noticeable.

The results showed the story was a success, being able to *intrigue* and guiding the players through the *story beats*, whilst giving them the freedom to explore at their own pace. One down side we found by analysing the results was that because of the agent's weaknesses and the complexity of the story, players could often get lost, which will happen less if the interaction is improved.

## 7. Discussion

During the development of our work, although we managed to achieve many improvements in order to make a game using the Virtual Suspect, there were certain constraints that limited our ability to improve the experience and interaction. These constraints related with the Story Creation process using the Virtual Suspect, the Alexa Skills Kit, and improving the interaction.

The Virtual Suspect Story Creation is done in an *XML* file where the developer has to deconstruct its story into entities and events, this process is obtuse and exhausting.

The Alexa Skills Kit, although being innovative and quite advanced, has a limited amount of feedback given to the developer when the skill has a problem, making debugging a process much harder than it needs to be.

## 8. Conclusion

In conclusion, this was a interesting new route for the continuous development of the Virtual Suspect, creating a game with the aforementioned agent. If the objective was successful depends on:

- We were able to create a story that could be adapted to the Virtual Suspect, whilst using its strengths to create a unique experience;
- We were able to improve the way the agent interacts with the players;
- We were able to use the unique lying mechanic in an engaging way.

Looking at our results, we can consider the project a considerable success, whilst being attentive that the agent's interaction can be further improved. We were able to create an engaging story that could be adapted to the agent, whilst using the lying mechanic in an interesting way and improving the agent's interaction.

In order to improve the Virtual Suspect as a tool to be used in a game, there are a variety of things that we consider highly important. Including improving the story Creation process, improving the relationship between events and the entities it comprises, improving the lying mechanic and being able to talk with multiple characters.

## References

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