

# Project for Gesture Based UI Development

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GitHub Repository: <https://github.com/GallagherStephen/GestureProject2021.git>

Screencast: [https://youtu.be/fo-C\\_a2Od2o](https://youtu.be/fo-C_a2Od2o)

## Purpose of Application:

### *Overall:*

The aim of the game is to be able to play it in a variety of ways by combining different gestures and using various pieces of hardware. The game performs well by using gestures/recognition from the webcam to play the game while using speech gesture to navigate in the game while also being able to return to mouse and keyboard for anyone who wishes too. The integration of all this hardware and software makes the game's goal more exciting because it allows for several languages to be learned.



### *Interfaces:*

As you can see from the pictures, each user interface has three interactive buttons. The main menu interface is a static page that does not need an image to be displayed for quick navigation, while the in-game scenes for guessing word translations are displayed by recognizing an image through the camera and using speech or keyboard and mouse to communicate.



### *Colour choices:*

The user interfaces are designed in a certain way. I chose a “easy on the eyes” style. I chose colours that I would describe as student friendly. This is the emphasis I choose because I believe students would be the ones who use the application/game the most. I wanted the look to be as straightforward as possible without overcomplicating the game's overall feel.

The colour schemes used in the user interfaces were also based on research I conducted prior to beginning the application/game. This dictated the colours because it has a significant impact on how many people come to your app/game. According to my research, this is an often-overlooked part of game development. As you can see from the picture below, the first experience a user gets when they open your game is crucial. You want to have a strong first impression, so if choosing the correct colours in my application has such an effect, I believe a little time spent studying and checking is not much for a positive overall response.

Link to researched page:

<https://bishopgames.com/importance-colors-game-design/#::~text=In%20video%20games%2C%20the%20color,to%20nail%20your%20color%20schemes.>

palette. In video games, the color palette is your first impression. It can set the mood of a whole game or generate emotions within you before you even start playing it. So if you plan on making an immersive video game, you absolutely have to nail your color schemes.

### *Help Aid:*

An extra benefit of assistance was added to the game in case the player was unaware what image was being requested of them. To tell them which one to display, I added some text to the screen when on webcam. As you can see in the image below.



### Sounds/Ambiance:

Sound was added to the scenes to help create a sense of ambience in the game. Throughout, I wisely picked elevator/calm music. Since I studied the logic behind this choice of sounds, as you can see in the following link and image below, these sounds can relax the user without them even realizing it. <https://www.audio-technica.com/en-us/blog/science-behind-relaxing-effects-music/>. In the "in-game" scenes, I keep the volume lower, while in the menus, I keep it at a regular pace. This is done so that the player is not distracted by playing the game and can enjoy when in the menus, where the level is higher than in-game.

### **The Best Type of Music for Relaxation**

As mentioned above, the type of music you listen to affects your body in different ways, which can result in different moods.

Just as fast, upbeat music may provide a burst of energy while exercising, slower music [has been shown](#) to be more relaxing. Classical music, in particular, can help slow the pulse and heart rate, as well as decrease levels of stress hormones. So, if you're looking to wind down after a long day, opt for slower instrumental, classical, or ambient music.

### Game Goal:

Make it to the end of the game by correctly answering any of the questions put to the user. In addition, you can gain experience speaking a language of your choosing. Depending on your subscription/account. While also learning the language of choice.

Unlike most entertainment games, this game is meant to be made for the purpose of learning and teaching.

### Gestures identified as appropriate for this application:

The two gestures I have incorporated into the application that coincide mouse and keyboard are facial/Photo recognition to begin game and each round with the use of a webcam. In addition, voice expressions are used to monitor the game's actions with the use of a microphone. The two gestures, in my opinion, fit well together because they offer a different way to play the game than simply using the mouse and keyboard

### Webcam gesture use reason:

I choose to use Gestures with a webcam over other third-party products such as a "Myo Armband" because I think a webcam is easier to obtain. Webcams, I believe, will be used for many years to come and will be a part of many devices in the future.

Another reason behind using the webcam for my game was for account/game authentication. This, in my opinion, is a smart way of controlling user access. I may manage which languages and content are available to whom depending on whether or not their picture is stored in the database.

### *Voice Gesture Reason:*

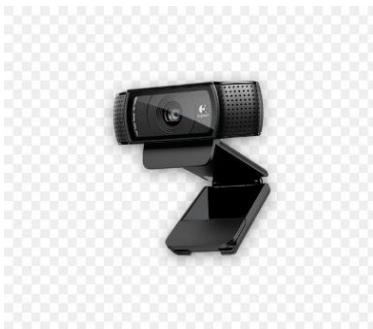
I decided to use Voice gesture in my game because I believe that not only will people learn the vocabulary, but they will also want to pronounce the words they believe are right answers. They'll say the word, and if it's pronounced right, they'll get to the next scene.

Another explanation for choosing voice recognition was that it is very fun in games and can enhance the user's experience by allowing them to sit back and play without having to press each button in the scenes.

## Hardware used in creating the application:

The webcam and microphone were the two pieces of hardware I concentrated on while creating my game, but I did include the option to play the game with the use of a mouse and keyboard for a more universal experience. Below are the two specific pieces of hardware I used, along with photographs. These two pieces of hardware, in my opinion, complement each other well. They offer different ways to play games.

The use of the two hardware devices brings the user away from their normal way of engaging with games, which I think is a welcomed addition.



*C920 webcam & SudoTack Microphone:*



From my own background knowledge on webcams I also used "**my Sony A5000 camera**" which I have turned into a webcam as it is much better for quality and I cannot stress it enough. I tested this with my game, and it worked perfect! The two components to make this work with good quality are as follows:

1. Sony camera
2. Video Capture to allow use as webcam



### Webcam comparison to Myo armband:

As I said in a previous section, I believe that webcams will remain a piece of hardware for several years, and when compared to certain third-party devices such as the Myo armband, you can see from the picture below that the Myo armband did not last long, as they discontinued sales on October 15, 2018.

Canadian firm Thalmic Labs has announced the end of sales of the **Myo armband**, a **gesture-control** device which was being explored in the realm of prosthetics. 15 Oct 2018

Webcams are also being produced for the majority of devices around the world. You may get them not only embedded into computers, but also externally with higher quality and much more.

While they necessitate expense beyond a **laptop** or PC, external **webcams** are apt to have **higher** quality components that allow for fine tuning. Embedded **webcams** are typically small; small components directly impact the level of **camera** performance and image quality.

### Microphone comparison to controllers:

Speech gestures, in my opinion, complement the use of games and, by far, make the use of an application much simpler than using a controller. In contrast to a controller, speech movements do not come with a hefty price tag if something goes wrong. As I mentioned above, a consumer destroyed his television when using a "controller" that was considered safe to use.



Link reference:

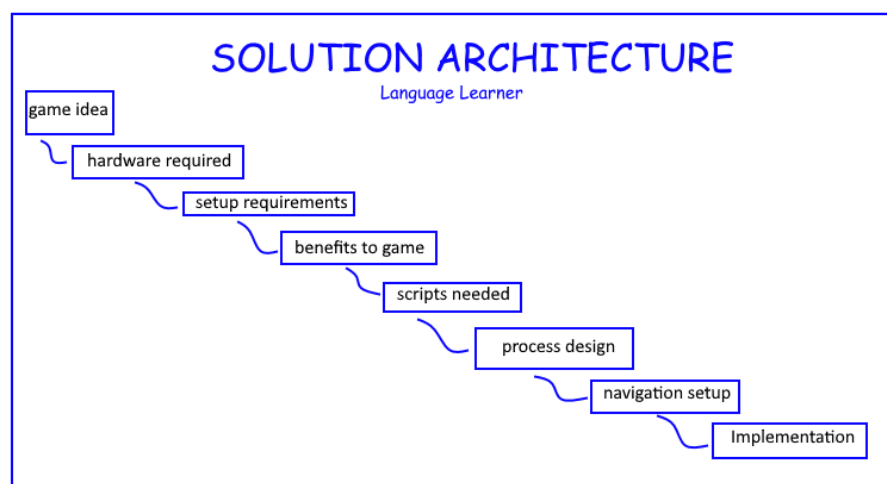
[https://www.engadget.com/2006-11-20-wiimote-strap-breaks-controller-destroys-tv.html?guccounter=1&guce\\_referrer=aHRocHM6Ly93d3cuZ29vZ2xlLnNvbS8&guce\\_referrer\\_sig=AQAAALraiY2gt7Ygm9vO4v3D8tSPrDqJvJ1XDKSOX56x3DtR77ESGt3-ar6AR-YZOgoSwl6NXG7FoEEIxZBsUw-Bt8Reydf27yuBQ8Wp1Ggot4hRu7kkl5ZMisTth5lpXSvsE\\_4F-lIQYmrNE845XgeAGKC-rWXVoJvKJk3bmb2sd5](https://www.engadget.com/2006-11-20-wiimote-strap-breaks-controller-destroys-tv.html?guccounter=1&guce_referrer=aHRocHM6Ly93d3cuZ29vZ2xlLnNvbS8&guce_referrer_sig=AQAAALraiY2gt7Ygm9vO4v3D8tSPrDqJvJ1XDKSOX56x3DtR77ESGt3-ar6AR-YZOgoSwl6NXG7FoEEIxZBsUw-Bt8Reydf27yuBQ8Wp1Ggot4hRu7kkl5ZMisTth5lpXSvsE_4F-lIQYmrNE845XgeAGKC-rWXVoJvKJk3bmb2sd5)

## Architecture for the solution:

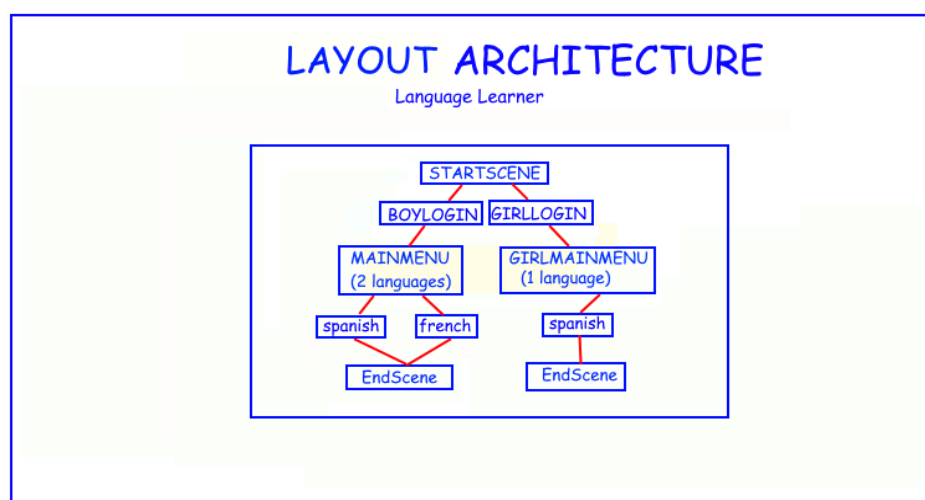
The game's architecture was designed to work with the hardware I selected. I've outlined the actions I've taken below, which I think accurately depicts my thinking process. I decided to create a game that suited the use of voice while still giving it a competitive advantage by using a webcam.

A new way to play the game was also considered in the architecture, as well as a sense of security when logging in to your account. This will show the user's option of one or two languages based on their account. This game of learning a language by gestures appealed to me.

Architecture for solution diagram below:



Architecture for general layout of game below:



## Gestures Implementation:

### Speech gesture

#### How I put it together:

I implemented Speech gesture with a "Grammar.xml" file that recognizes the grammar being spoken and accesses the corresponding method to perform in the "VoiceScript" file, allowing the two scripts to operate together.

#### How successful they are:

I think I have accomplished the goal I set out to accomplish with the "**speech.gesture**", as it is working well to my satisfaction.

#### How tested:

- Tested speech gesture by playing each scene and testing each phrase, word put into "**grammar.xml**" and "**VoiceScript**".
- Also tested with family members.
- Outputting a message in console to determine I entered each speech method

#### How they are used:

Used by saying the answer deemed to be correct by the user in game and getting a response, either correct and move scene or wrong and don't move scene.

### Webcam gesture

#### How I put it together:

With the assistance of "**Vuforia**," a website that stores gestures/images, I introduced the Webcam gesture. It was here that I built a database that included my images which could be used as a "**imageTarget**" in my game. I placed my UI on top of these images, which will appear whenever I show it to the webcam.

#### How successful they are:

I believe I have achieved the purpose I intended on getting out of the "**Webcam gesture**" with it working 100% to my satisfaction

#### How tested:

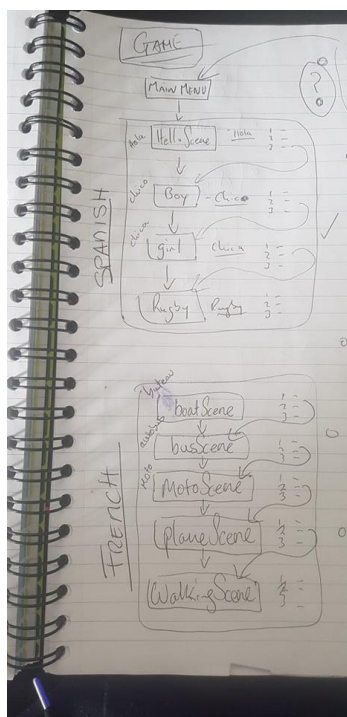
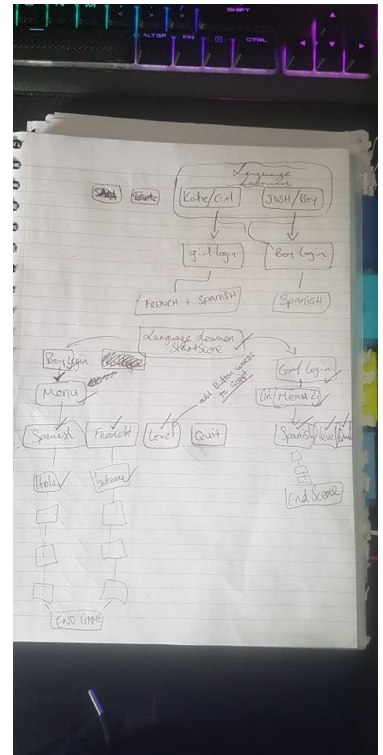
- Tested Webcam gesture by playing each scene and testing each scene with the image requested to achieve the scenes goal
- Also tested with family members.
- Tested with non-database images and database images

#### How they are used:

Used by displaying the word you wish to learn and determine the right answer for it is specific scene. Each scene specifically expecting an individual "**imageTarget**".

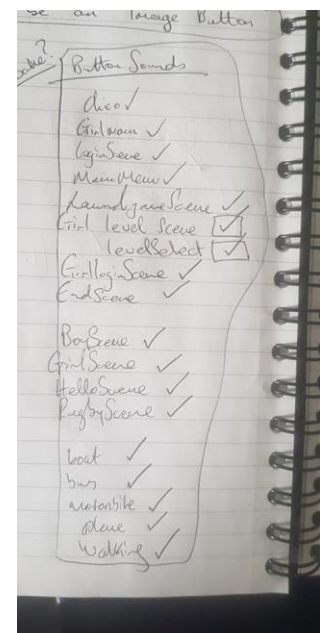
Workings/Notes on the application:

- As you can see in the image, I spent some time sketching out the architecture of my game before beginning to implement it. This helped me to thoroughly consider the system and making whether it was a smooth-flowing game.
- It gave me a general idea about what I wanted to do to finish the game to a high level.
- It demonstrated that I would need several Scenes, ranging from menus to in-game scenes.
- It also assisted me in identifying the places that I would like to monitor using speech and webcam gestures.



- As you can see in the image, I set out the in-game paths that the game would need to follow in order to complete the game.
- Here where I mapped out the course the user will take when they get the answers right to the translations.
- In both languages, we can see the routes clearly displayed as they can pass around the scenes for both languages.

- You can see my troubleshooting notes here, where I listed each scene I wanted to check, just for button sounds.





## Images needed to play the game:

### Login User Images:



### Learning Spanish images:

Hola

Rugby

Chica

Chico

### Learning French images:

Autobus

Avion

bateau

Marche

Moto

## Conclusions & Recommendations:

What I have learned from this project is that despite the fact that there is a lot of technology out there that can perform various forms of gestures, I feel that webcam and voice gestures will still triumph when it comes to gestures. This is true, in my opinion, that these are two pieces of technology that will never be discontinued and will continue to evolve with new gestures and capabilities.

I've even discovered the basics of configuring devices for gesture control. This, along with third-party websites like "Vuforia," makes it simple to set up and begin developing good and usable applications.

Personally, after creating my application with the use of the two chosen hardware devices I don't think I would have chosen differently unless there was a new breakthrough of hardware after being released. The only new hardware that comes close to being a major wall breaker, in my mind, is the oculus headsets, but even those have a lower chance of surviving decades than a camera or microphone in my opinion.

What I enjoyed most about this project was that I got to make an immersive game that wasn't just controlled by a mouse and keyboard, and unlike every other game I'd made before, this one was a learning game/application that was designed for educational purposes rather than just for fun.

When I finished the game, I felt very satisfied because I think it would be a good app for learning and teaching. A game with an intent other than entertainment.

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## References of research:

- Wii remote breaking tv  
[https://www.engadget.com/2006-11-20-wiimote-strap-breaks-controller-destroys-tv.html?guccounter=1&guce\\_referrer=aHRocHM6Ly93d3cuZ29vZ2xlLnNvbS8&guce\\_referrer\\_sig=AQAAALraiyT2gt7Ygm9vO4v3D8tSPrDqJvJ1XDKSQX56x3DtR77ESGt3-ar6AR-YZOqoSwl6NXG7FoEEIxZBsUw\\_Bt8Reydf27yuBQ8Wp1Ggot4hRu7kkl5fZMisTth5lpXSvsE\\_4F-IIOYmrNE845XqeAGKC-rWXXVoJvKJk3bmb2sd5](https://www.engadget.com/2006-11-20-wiimote-strap-breaks-controller-destroys-tv.html?guccounter=1&guce_referrer=aHRocHM6Ly93d3cuZ29vZ2xlLnNvbS8&guce_referrer_sig=AQAAALraiyT2gt7Ygm9vO4v3D8tSPrDqJvJ1XDKSQX56x3DtR77ESGt3-ar6AR-YZOqoSwl6NXG7FoEEIxZBsUw_Bt8Reydf27yuBQ8Wp1Ggot4hRu7kkl5fZMisTth5lpXSvsE_4F-IIOYmrNE845XqeAGKC-rWXXVoJvKJk3bmb2sd5)
- importance of colours in a game  
<https://bishopgames.com/importance-colors-game-design/#:~:text=In%20video%20games%2C%20the%20color,to%20nail%20your%20color%20schemes.>
- Importance of music choice in games  
<https://www.audio-technica.com/en-us/blog/science-behind-relaxing-effects-music/>
- Rise of speech in gaming  
<https://voicetechpodcast.com/articles/design/apps/the-rise-of-speech-recognition-technology-in-gaming/#:~:text=Voice%20recognition%20is%20now%20being,converse%20with%20non%20playing%20characters.&text=In%20these%20games%2C%20the%20players,to%20communicate%20with%20one%20another.>
- Benefits of game-based learning  
<https://www.teachthought.com/technology/6-basic-benefits-of-game-based-learning/>
- Research into webcam gestures with example  
<http://www.cs.toronto.edu/~aamodkore/more/reports/glive/itsp.html>
- Webcam for gesture recognition Blog  
<https://www.electronicdesign.com/technologies/embedded-revolution/article/21802522/webcams-for-gesture-recognition-and-more-vision-tricks>
- Myo Armband officially gone  
<https://venturebeat.com/2018/10/12/amazon-backed-wearables-company-thalamic-labs-kills-its-myo-armband-teases-new-product/>