

## OVERVIEW OF GAME

The puzzle will consist of a dollhouse with a window and a door. The player will be provided with an information sheet that provides a background on the people who used to live in the house along with pre-defined clues that can be asked of the ghost, a Morse Code translation sheet, and a laser pointer. The player will have to use the information provided in the information sheet to solve the puzzle.

The player's job is to use the laser pointer to communicate with the ghost through the window of the house and find out its name, thereby setting it free and opening the door of the house, which either holds the key or a clue to another piece of the escape room. The player can ask the ghost for four of the pre-defined clues about its personality and has one chance to deduce and communicate to the ghost its name from the information sheet. This puzzle will not be timed as it relies more on the smart choice of the four clues than on the ability of the player to think quickly.

The laser pointer's flashes will be picked up by one of a set of photodiodes placed inside the dollhouse by the window and a current pulse generated. The ghost will communicate using an LED that is programmed to flicker in Morse code depending on the clues asked by the player. A Nucleo-64 STM32 microcontroller will be used to process the current generated by the photodiode and to send corresponding signals to the LED to flicker in response.

Once it has been recorded that the player has asked for four clues (this will be done by programming the microcontroller to keep track of the number of distinct inputs it receives), the system will no longer accept "questions" to the ghost and will only provide an output if the name of the ghost is correctly entered by the user in Morse Code. The output will either be "WRONG", outputted in Morse Code through the LED, or, if the player correctly guesses the name of the ghost, the output will be in the form of the door of the house opening. The mechanism used to open the door of the house consists of a DC Motor + Relay system connected to the door by a string that coils around the motor when the motor turns on, thus causing a tension that pulls the door open.

## BACKGROUND STORY

Matthew and Karla Smith were a wealthy couple who lived in a large but modest house on the fringe of the suburbs with their eight children. They had a view of the nearby uninhabited mountain from one window, and a view of their sleepy neighbourhood from another. Their children did everything together but were all unique. Their names were Aeo, Ann, Aly, Bay, Amy, Ava, Ada, and Kat. Amy, Aly, Ann, Ava, and Bay were all loud and cheerful children, while Aeo, Ada and Kat were quiet and sensitive. Matthew and Karla would often be woken up in the early hours of the morning by the sound of Ava, Bay and Kat dancing to music. Amy, Ada, and Ann would stay awake late at night to sew just one more dress for their dolls or one more bag for shopping. Aeo's and Aly's talent went mostly unnoticed, as they would paint at school when they had free time. The children would often argue over what colour to paint the walls of the house with: Amy, Aly, and Ava would attempt giving the house a pink finish, to which Ada or Bay would rush in and try to stop, for they always wanted the walls to be painted green. Aeo, Ann and Kat

would keep quiet, secretly wondering if red walls would look as good in real life as it did in their heads. While Amy, Ada and Alan laughed out loud at horror movies, Kat, Ava and Ann would hide in a tent in another room and tell each other funny stories. Aeo and Beth, on the other hand, being the oldest and having no time for ghosts or funny stories, would normally engage themselves with family dramas. Whenever Matthew came home after a business trip, most of the children—much to Karla’s chagrin—would leap into his arms and tell him everything that had happened while he was away. However, Aeo, Ava, and Kat would always prefer mom to dad. Half of the children loved fries more than any other food, but Bay, Ava, Alan, and Ada would scrunch up their faces whenever fries were made for them. Like most children, a good number of the Smith children wanted a dog. Alan, Ava, and Amy wanted a cat, and Bay and Ada wanted a fish.

It was a humble but peaceful and happy existence. Unfortunately, one day, tragedy struck the family.

Out of nowhere, the whole family died when a section of the roof of their farmhouse completely collapsed, and the house has remained abandoned for many years since due to the disturbing circumstances surrounding the deaths. People in the suburbs even claim that the ghosts of the family continue to roam the halls of the house, making the lights flicker.

Today, on October 31<sup>st</sup>, more than thirty years after the Smith house became abandoned, you’ve come all the way out to the far end of the suburbs near the mountain after a long night of trick-or-treating. In your Halloween zest, you stop by the abandoned house and take a good look at it. The light inside a window begins to flicker, casting an eerie glow.

You suddenly recognize that the flashes of light are *Morse Code*. You whip out your flashlight and shine it into the window of the house in response, on a whim, just in case there really is someone there. You even walk up to the door of the house and try to open it, but it’s locked.

Sure enough, your response has been recorded by whoever’s in the house, and they tell you their story.

They know that they used to have a happy life in this house. They used to play with their seven siblings and listen to their dad’s stories and have their mother sing to them some nights. But one day, the walls of the house suddenly caved in, completely disorienting this ghost, and when this ghost finally got clarity, he/she found that all of his/her siblings were gone and so were his/her parents. Now he/she is all alone, cannot remember his/her identity, and knows that until he/she finally remembers his/her own name, he/she will never be free and will constantly be trapped in this lonely house, roaming the empty halls with no purpose.

You decide to try to help this ghost, given what you now know about the Smith family children. You decide to ask the ghost a few questions about his/her personality to try to figure out their name and tell it to them.

## RULES AND HINTS LIST

You get to ask 4 hints of the ghost. There are 7 hints available for you to choose from. Once you’ve asked 4 hints, no additional requests for hints will be accepted. You can ask the same hint as many

times as you want if you need to see the answer multiple times for any reason. However, once you've asked for 4 distinct hints, you will not be able to revisit any hints and the system will only accept your final answer.

The list of hints is given below. The two-letter commands in parentheses correspond to the letters that you must enter in Morse Code using the laser pointer.

### List of Hints:

First Letter of Name (FL)

Favourite Food (FF)

Favourite TV genre (FT)

Favourite Animal (FA)

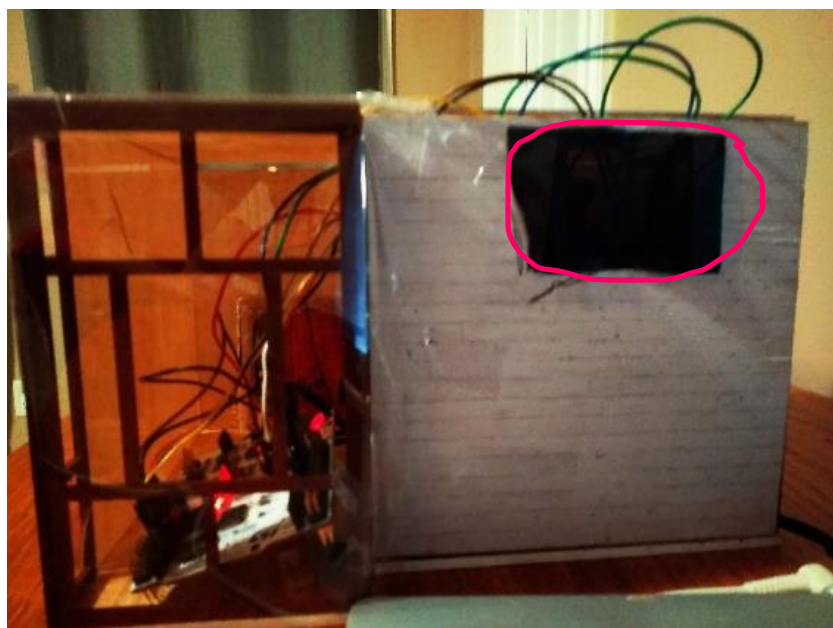
Favourite Colour (FC)

Favourite Parent (FP)

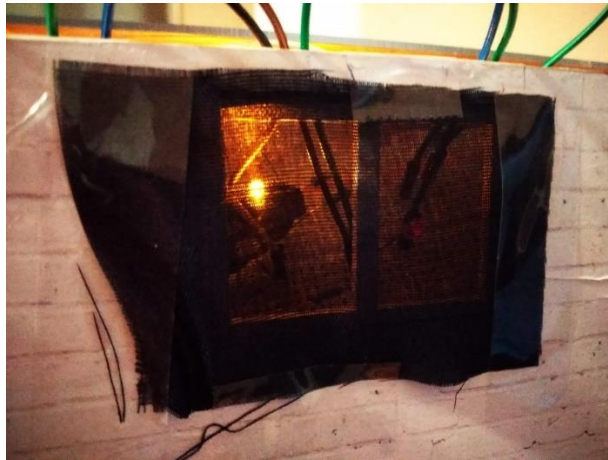
Favourite Hobby (FH)

### EXPLANATION OF INDICATOR LIGHTS AND OPERATION OF GAME

You will be pointing the laser light through the window of the model house as shown (window circled in pink):



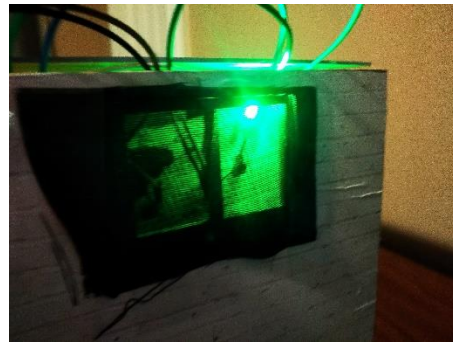
You will receive responses to your hint requests in Morse Code through this yellow light:



Each hint command consists of two English letters (e.g. 'FC' for 'favourite colour'). Each English letter requires at least one dot/dash and at most a sequence of four dots/dashes to be expressed. 'F' is dot-dot-dash-dot. The system is programmed to wait for a sequence of four dots/dashes, so if you enter a letter which has less than four dots/dashes, you will have to wait for the program to process your input. The green indicator light will turn on when your valid letter has been successfully received. If the red light turns on, it means you have entered an invalid input and you should enter your letter again.



Red Light indicates invalid input



Green Light indicates input is valid

Once you have exhausted your four hints, a blue indicator light will turn on:



If you try to ask for any hint at this point, the red indicator light will turn on to inform you that you are expected to enter your final guess for the name of the ghost. You only have one chance to enter the name of the ghost. The blue light will remain on until the game ends. The other lights continue to function as specified above.

## INTERNATIONAL MORSE CODE SHEET (IMAGE MODIFIED FROM WIKIPEDIA.ORG)

- To morse a dot using the laser pointer, press the button and release it immediately.
- To morse a dash using the laser pointer, press and hold the button for a few seconds before releasing the button.

A	• —	U	• • —
B	— • • •	V	• • • —
C	— • — •	W	• — —
D	— • •	X	— • • —
E	•	Y	— • — —
F	• • — •	Z	— — • •
G	— — •		
H	• • • •		
I	• •		
J	• — — —		
K	— • —		
L	• — • •		
M	— —		
N	— •		
O	— — —		
P	• — — •		
Q	— — • —		
R	• — •		
S	• • •		
T	—		