Homework 1 for Einstein group

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ECE478

Introduction

This report contains a detailed explanation of the homework 1 assignment for the Einstein group.

Learning Outcomes
The purpose of this homework was to fulfill the following learning outcomes.

1. Use of Kinect to control a robot, to create commands and data for a robot.

2. The concept of state machine in robotics

3. The concept and use of fuzzy logic in robotics

4. Using Powerpoint for scenario prototyping

5. Dialogs with robots

First phase explanation

Figure 1: A high level diagram of the first phase objectives
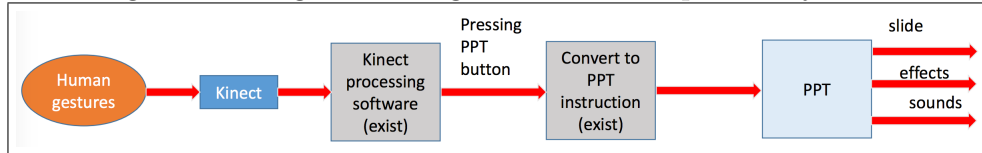
The objective for the first phase of this homework was to:

1. Figure out how to use a Kinect to control the mouse on a computer

2. Figure out how to use Kinect to control a powerpoint presentation

3. Create a powerpoint presentation with info, effects, figures, pictures, and videos about Einstein and the "Quantum Debate" play

4. Record voice with German accent that is suppose to be Einstein for the powerpoint presentation

In order to meet these objectives, our group did the following:

- We created a powerpoint presentation using Microsoft Powerpoint.
    - The powerpoint presentation contains
        * Famous quotes from Einstein
        * History about Einstein's life, achievements, and hobbies
        * Einstein's parts in the "Great Quantum Debate", Acts I and II
        * Lots of pictures of Einstein himself and things related to him
        * A voice with a german accent that reads what is on the slide
    - Within the powerpoint presentation, several macros were created using Microsoft Visual Basic for Applications.
        * Macro code can be found here? (need info from david)
        * Macros were used to make buttons that could be clicked on with the mouse to transition to another slide

- We found software called KinectMouse for controlling a PC mouse and powerpoint presentation with Kinect
  - The software can be located here [1]
  - There are detailed instructions on how to use this software here [2]
  - We also found a tutorial on how to use a face to control the mouse with this software here [3] but never had time to implement it
- We found some other software to do voice effects? (need info from Waleed here)

Group roles for first phase

- Powerpoint: Will, David, Waleed
- KinectMouse: David
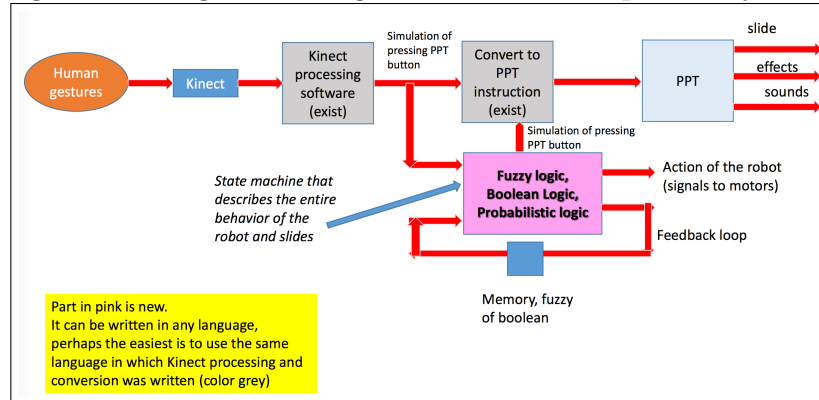- Voice effects: Waleed
- Documentation: Will

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[1] https://kinectmouse.codeplex.com/
[2] http://futuretechblog.com/?p=26
[3] http://futuretechblog.com/?p=71

Second phase explanation

Figure 2: A high level diagram of the second phase objectives

The objective for the second phase of this homework was to:

1. Create a state machine in software that describes the behavior of the robot, robots, and/or the entire theatre presentation

   - Could be deterministic, probabilistic, or fuzzy, or a mix of these.
   - Can have several machines communicating with one another.
   - Can be programmed in any language.
   - Should use Microsoft Powerpoint and Kinect software

2. Record a video demonstration

In order to meet these objectives, our group did the following:

- We chose to use python for programming the state machine

- A python class object was created to describe the behavior of the Einstein robot

  - It is appropriately titled "Einstein"
  - It can be found here [4]
  - It contains multiple ways to potentially control the behavior of the robot
  - The behavior of the robot is determined by probabilistic logic using random number generators

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[4]https://github.com/wrh2/ECE478/blob/master/Einstein/Einstein.py

- A python program was made to demonstrate the python class object
  - It is called "main"
  - It can be found here [5]
  - It takes arguments from the command line, parses them and then calls the appropriate method in the Einstein python class object
    * Code requires the following python libraries to run: argparse, random, Einstein.py (see footnotes on page 4)
    * There is also a README located here [6]
- We introduced macros within the powerpoint presentation that exhibit probabilistic logic
  - Need info from Dave on this
- We introduced macros within the powerpoint presentation that utilize the python code to "interact" with the robot
  - Need info from Dave on this
- We recorded a video demonstration of our project
  - Shows the use of the Kinect software to control the mouse and powerpoint
  - Shows effects and voices in powerpoint presentation
  - Shows the interaction between the powerpoint and python software

Group roles for second phase

- Powerpoint: Will, David, Waleed
- Powerpoint macros: David
- Python programming: Will
- Video recording/editing: David, Will
- Documentation: Will

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[5]https://github.com/wrh2/ECE478/blob/master/Einstein/main.py
[6]https://github.com/wrh2/ECE478/blob/master/Einstein/README.md

Results

- Successfully used Kinect to control mouse and powerpoint presentation
- Successfully demonstrated interaction between powerpoint presentation and python code
- Showcased fun and interesting information about Einstein using voice effects, images, and sounds in powerpoint
- All materials (presentation, video, report, code) can be found here [7]

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[7]https://github.com/wrh2/ECE478/tree/master/Einstein