B39VT Interactive System Project Specification

Introduction

Sensing is key to many autonomous systems and this project will be making extensive use of a variety of sensors to develop a system that can operate with a level of autonomy

Design ability is one of the key objectives of the engineering process. A successful design requires the application of a combination of creativity, skill, and the ability to analyse and synthesise.

The purpose of this design project is to provide an opportunity for these abilities, which you have begun to acquire in the first, second and third years of the course, to be exercised in conditions similar to those under which engineers work in the industry.

Many industrial products and processes use a combination of computing, and embedded software and digital technologies applied to some physical system, the design project contains elements of each. This project is structured to give you experience of designing across artificial disciplinary boundaries, its successful completion requires you to exercise system integration skills.

Background

Solo-Games is a newly formed company to produce intelligent solutions for sensor based user entertainment systems. Their business model is to manage the design, delivery and maintenance of the automated equipment for a robotic system. However, they outsource the technical development of the equipment to 3rd party electro-mechanical design companies.

Their first project is with a company that develops interactive systems for use in care homes. They have specified the need for an automated system to play games with people who are having to spend a long time on their own in the care homes.

The company has contracted Solo-Games to design and deliver an automated system that will be on top of a mobile robot that will autonomously navigate its way to where the people are. When the robot arrives the people will be able to play a game with the system on top of the robot.

A set of companies have been asked to bid for the contract by building and demonstrating a proof-of-concept unit. The final decision on which company gets the contract will be based on a public competition to be run in Spring 2021. At this event, each machine will be demonstrated and supported by the submission of a suitable technical document.

Specifications

1. Develop a full set of design documents for a small system that plays a game with the user and is delivered on top of a Turtlebot robot. This will all be done using simulation environments as we will not have access to the lab facilities this year.
2. The user must be sensed as being present but must remain at least 20cm from the machine.
3. The interaction to be in the form of a game that you will design and propose. The choice of what the game is up to the team to determine
4. The system should indicate if the user failed in their task or there is some other issue.
5. Once started, the machine is to run without operator intervention. It should, however, interact with the user through physical movement, PC interface, and any appropriate LED indicators to show the user what is happening.

6. The robotic alien to include:
    - Minimum of two servo motors, as many as are required may be used.
    - One distance sensor.
    - At least one other sensor
7. The proposed system is based on Arduino Microcontroller (or other microcontroller that you can simulate).
8. The arrival of the robot at a user should prompt a set of activities:
    - Check that user is in front of the robot.
    - Play the game.
    - Prompt with the result.
9. Preferably the game should fit onto a 300mm by 300mm baseboard. Height to be less than 500mm.
10. Teams may add additional features after agreement with the project manager.