MTRX 1701 - Introduction to Mechatronic Engineering

Semester 1, 2017

Tutor = Nick Asthanasios

Name = Keegan Gyoery

SID = 470413467

Assignment 1

1 Part 1

The mechatronic system that I have chosen is the on-board computer system present in cars, more specifically the computer that regulates the engine and its functionality. The engine computer in production cars serves a multitude of purposes, aiming to generate maximum performance from the engine, whilst also minimising environmental impacts such as $CO2$ emissions. This computer receives sensory input from a wide variety of sources due to the complex nature of the engine and its moving parts.

(a) The sensors present within this system include:

- Engine and oil temperature sensors
- Air pressure and temperature sensors
- Oxygen sensors
- Leak sensors
- Spark plug sensors
- Timing sensors
- Throttle position sensor
- Rotational sensor
- Clutch position sensor
- Accelerometer
- Traction sensors

All of these sensors are used by the on-board engine computer in order to maximise performance of the engine in response to the user's input and the current conditions to which the car is being subject to. Furthermore these sensors provide input to the controller in order for it to work out the operational conditions to maximise efficiency and to minimise emissions.

(b) The actuators used in this system include:

- Spark plugs in order to ignite the combustion at the correct time determined by the computer system
- Small motors to separate the clutch plate from the engine when the clutch is depressed
- Small motors (synchro) to bring the engine speed up to the speed of the driveshaft for that gear ratio when clutch is re-engaging
- Valves that regulate the flow of fuel and oxygen to the engine for combustion, to increase speed of engine via greater combustion
- Electronic displays such as speedometers, tachometers and warning lights

(c) The sensory information provided by the multitude of the sensors to the controllers should be used alongside the user's input to provide the optimal solution to not only the user's desired actions, but also to the environment within the engine and outside the car. For instance, the input of the driver pushing his foot down on the throttle sends an input from the throttle position sensor to the controller, which is then used to determine the speed at which the engine should revolve at, as desired by the driver. However this input should be used in conjunction with the input the controller receives from the traction sensor, telling the controller if the desired speed is actually being transferred safely to the wheels. If it is not being safely transferred, the controller must regulate the throttle position sensor's input in order to maintain traction.

(d) The user interacts with this system via the throttle, brake, clutch, transmission and any sport mode settings. These functions are the only input that the user can provide to the engine computer, which are then referenced against the computer's other sensory inputs to determine the best course of action. This system regularly interacts with the user through the tachometer, speedometer, engine and oil temperatures, warning lights such as oil pressure warning and traction loss lights.

2 Part 2

(a) A priorities matrix for the robotic pizza delivery system would be similar to the following.

	Constrain	Optimize	Accept
Feature		X	
Cost	X		
Time			X