Coursework– Smart Home Device

Homes are becoming smarter and they are increasingly interconnected; household appliances and amenities are becoming more energy efficient, labour saving and pleasant to use. We are just at the start of this revolution - smart home devices available today include the voice controlled speakers, colour changing smart light bulbs, security lighting, smart thermostats, smart locks, smart cameras, robot vacuum cleaners, cookers, lawnmowers, sprinkler systems, washing machines …

Figure 1 source http://www.asyouwishelectric.com/images/home-automation.jpg

Many of these devices are part of the "Internet of Things (IoT)" -a term given to the network of objects – such as home appliances and vehicles - and structures - i.e. entire buildings. These devices share electronic data sensing and actuator capabilities that us electrical engineers design.

In the laboratory class, you considered the design of an Intelligent Kettle which had an electronic control panel allowing temperature control and various sensors to avoid overfilling and safety. You reviewed the patent it was inspired from, which includes a schematic describing the system structure and behaviours, and the user interface control panel.

For your coursework assignment, you are asked to outline the design a **Smart Home Device of your choosing** (subject to PGTA approval and *not* a kettle). The only constraints on your design is that it must have electronic sensing and actuator capabilities.

Deliverables

There are three primary deliverables for this work which should be submitted to Canvas:

1) Diagrams: A set of 3 draft SysML diagrams: Requirements diagram, Block diagram and Activity Diagram.
2) Demonstration and Code: The output of a Python prototype demonstrating device, together with the python source code.
3) Report: A 200-word design commentary (template provided).

Advice on completing this assignment:

1) SysML diagrams: Your SysML diagrams can be by hand drawings or electronic. Each diagram should be no more than one page in landscape format and have approximately 10 nodes (elements) and relations between them, and conform to the SysML standard. Do not provide more detail than this e.g. multiple activity diagrams.

2) Python code: The Python prototype should aim to demonstrate the main operation of your device. It will follow on from the structure block diagram and activity diagrams, which themselves build on the requirements diagram. For example, the block diagram identifies the user's interaction with the kettle such as closing the lid and pressing buttons. These can be designed in python through a simple button interface to initiate the function calls to (e.g.) increment the temperature or change the lid state (a Boolean variable). Conversely, the activity diagram identifies the internal flow of control such as checking the current temperature and switching the heating element on or off. Ensure that your code is verified and validated through inline tests if possible.

3) Design commentary: should will determine how you have achieved a representative sample of the learning outcomes through your designs. It comprises of a table of 8 questions against which you will provide short (25 word) answers. The template will be available on canvas.

4) This is a 10-credit module which constitutes 100 hours of study. 30 of these are lecture and lab based. The 10-minute canvas quizzes should take no more than 3 hours in total. The remaining time hours should be spent on this coursework; there is no exam to revise for.

5) Keep it simple and creative – consider basic device functionality only at a similar level to that of the laboratory class. Pick a device you have some personal interest for (but not a kettle)!

Mark Allocation

This coursework will constitute 80% of the module mark with the addition 20% awarded from completing the Canvas quizzes which test your comprehension (10%) and from completing the foundation laboratories (10%).

For the individual elements, the marks will be determined based on the following aspects:

- SysML: Notational correctness; wide and appropriate use of model elements.
- Python Code: Working output (verified by PGTA in week 10), comments, structure, testing.
- Assignment commentary: quality of responses.

Support

PGTA support and feedback for this coursework will be provided in laboratories (please see timetable for more details).

You will be required to demonstrate your python code to a PGTA in either weeks 9 and 10 – you will be informed which nearer the time.

Please refer to canvas for more support details regarding Python and SysML use.

There is a discussion forum set-up to address assignment queries. Please use this in the first instance.