1 Introduction

This assignment involves you in modelling a Home Security & Safety (HSS) system using the range of notations that have been taught in class. The system will be software based, but will involve components which are not software based, as is the case with many real-world systems. The requirements for the HSS system are detailed in §2, while in §3 and §4 the tasks and deliverables that are expected of you are described respectively.

2 System Requirements

The HSS system will involve a number of distributed components, e.g. sensors, monitors, controllers and actuators. Two levels of sensors are to be used, i.e. external and internal. The external sensors, as their name suggests, operate outside a building and detect motion, while internal sensors are design to detect vibration, motion and smoke within a building. In terms of actuators, HSS will be attached to four alarms. Two located within the building, one for smoke, the other for intruders (either internal or external). The other two alarms will be linked via telephone lines to a police and fire stations. The key decision making part of the system is performed by a centralized controller. Using the controller console, a user can perform the following operations:

- entry security code
- change security code
- enable sensors
- disable sensors
- reset sensors (after alarm)

Note that all interaction via the console will require the security code to be entered first. Note also that as long as power is supplied to the controller it will remain operational, so there is no requirement for an on/off operation.

There are two sets of external sensors and two sets of internal sensors. Sensors are binary, e.g. either a sensor detects motion or is does not. Each sensor set is formed from three identical, but independent, sensors. This enables a majority vote approach to monitoring sensors, i.e. the sensor value returned to the controller is calculated as the majority of the sensor readings, e.g. if two sensors indicate smoke and one indicates no smoke, then the detection of smoke is communicated to the controller. As mentioned above, there are different kinds of alarms. The decision as to which alarms are activated are taken by the controller.
3 Tasks

For the system described above, you are required to develop both a *function-oriented* and *object-oriented* models of HSS. Specifically you are expected to complete the following tasks:

**T1:** Function-oriented perspective:
- **T1.1** Develop *data flow diagram(s)* where appropriate.
- **T1.2** Develop *structure chart(s)* where appropriate.

**T2:** Object-oriented perspective:
- **T2.1** Develop UML *use cases*, both graphical and textual forms.
- **T2.2** Develop a *class-responsibility-collaborator* model.
- **T2.3** Model the static aspects of the HSS system using UML *class diagrams*.
- **T2.4** Model the dynamic aspects of the HSS system using UML *state machines, activity diagrams* and *sequence diagrams*.

4 Deliverables

Your submission *should* take the form of a report (hard-copy) and *must* include the following:

**D1:** A statement explaining any assumptions you have made about the requirements.

**D2:** Your design models, using a structure that reflects tasks T1 and T2.

**D3:** A short statement (100 words) on the strengths and limitations of the design notations that you have employed.

This assignment counts for 10% of the overall mark for the module and should be submitted via the course work box located outside the Student Office (room 1.24) by **12noon on Friday March 5, 2010**. Note that this is an individual project which means that your submission MUST be your own work.