

Assignment #2 Access Control System

Due Date: 21 December 2012

Description

For this assignment, you are asked to design an embedded system to control access to a secure room. The embedded system is to be based on an LPC2468 development kit and the FreeRTOS operating system. You will make use of the LCD display with touchscreen interface and the I²C bus with its four attached pushbuttons and four LEDs.

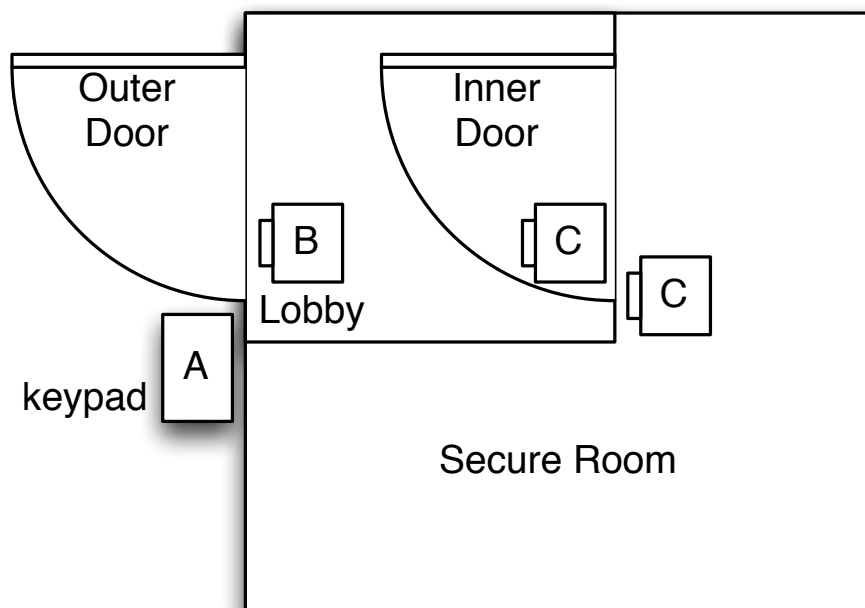


Figure 1: Secure Room Layout

Access to the room is through an outer door and an inner door. The doors are separated by a lobby. There is a touchscreen LCD display outside the outer door (**A**). There is a button inside the outer door (**B**) and a button both inside and outside the inner door (**C**). The two buttons at the inner door are connected in a wired-OR configuration and can be treated by the control system as a single button. Each door has a sensor that indicates whether the door is in the closed or open position. Each door also has a lock that can be controlled by the control system.

To enter the room, a person must enter a valid four-digit code using the touchscreen display **A**. On entering the correct code the control system should release the lock on the outer door for a maximum of five seconds, allowing the person to enter the lobby. Once the outer door has been closed, the person pushes the button **C** to release the lock on the inner door for a maximum of

five seconds, allowing them to gain entry to the secure room.

To leave the room, a person first unlocks the inner door by pushing button **C**. The system will unlock the inner door for a maximum of five seconds, allowing the person to enter the lobby. Once the inner door has been closed, the person pushes button **B** to release the lock on the outer door for a maximum of five seconds, allowing them to leave the room.

The system must prevent both doors being open at the same time. The door locks controlled by the system are used to prevent or allow the doors to be opened. They do not physically open the doors so the position of the doors must be detected using the sensors.

Use the four pushbuttons on the LPC2468 development kits to simulate the two door buttons (**B** and **C**) and the two door sensors. (Assume that a depressed button simulates an open door and a released button simulates a closed door.) Use the LCD display with touchscreen interface to simulate the keypad **A** outside the outer door. Use two of the four LEDs above the pushbuttons to indicate the state of the locks on the two doors. (Turn the LED on to indicate a locked door and turn it off to indicate an unlocked door.) The diagram below illustrates how each button and LED should be used.

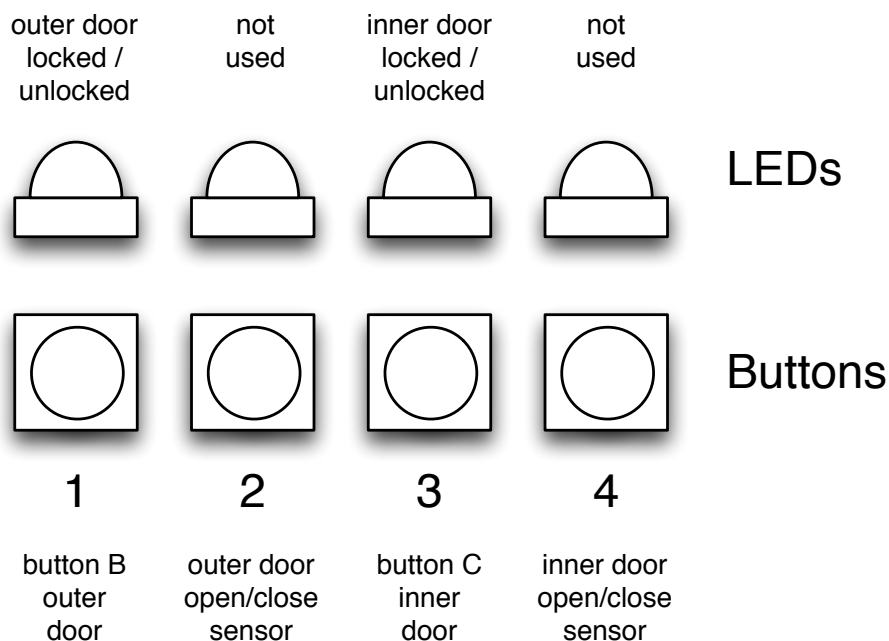


Figure 2: Buttons and LEDs

The locks on the doors are magnetic which means that a door is only locked if it is in the closed position when the lock is engaged. When designing your Access Control System, you should consider how to handle the race condition that may exist between sending a control message to engage the lock and receiving input from a sensor indicating that the same door is in the open position.

You should use a copy of your project from Assignment #2 as a starting point. You may make use of the sample code demonstrating the use of the I²C interface.

Deliverables

The deliverables for this assignment are:

- A µVision project containing your source files. You should “clean” the project and compress it before submitting it using Moodle.
- A typed report in PDF format describing in detail both the design and implementation of your access control system. Your report should include, for example, a description of any state machine used to control the system and your solution to the race condition described above, as well as any other details required to fully describe your design and its implementation.

The deadline for the assignment is Friday 21st December 2012.