Lab Assignment for ET0104 ECS

SAS code:
LAB3

Design a system, as specified, using UML, in a group. Then develop a prototype using the tools available in the lab or otherwise.

Guidelines

Each group should consist of 2 to 3 students and will be assigned a project as given in this guideline. A report is required, the format follows. A *neat handwritten* copy is acceptable.

1 After the system design is done using UML, each team member must work on the *use cases* as defined by the System Design of the product and produce at least one interaction diagram.

2 The Deadline for the report is on week 17.
3 Report should consist of:
3.1 Overall System Description
3.2 User manual
3.3. Use case diagrams
3.4. Interaction diagrams
3.9. Work assigned for each student
4. The assignment must be completed by week 17.
5. The prototype must be demonstrated

There should be sufficient time to work on the assignment during part of the lab period. Work consistently and maximise the time in the lab for testing the modules developed.

Marking Scheme

Item	Mk	Comments
UML Design (combined) UML design procedure followed Overall Report User Guide	 5 10 5	 Goals, constraints Introduction, problems, etc etc
Use Case (individual) Interaction sequence diagram Use Case workability Creativity in design Presentation/Interview	 15 15 10 10	 Inputs/Outputs, messages, control instructions Adapting requirements to prototype constraints
Graphics Interface	20	Using graphics LCD for interfacing
System Integration (combined) Overall workability	 10	 Modules work together
Total	100	

Minimum System Specifications

Below are the specifications of the minimum requirements. You are encouraged be creative to add in some features that will make your system more realistic.

Each project shall incorporate a graphical interface, for at least some interaction with a user. This should be documented in the draft report after discussing with your lecturer.

1. Washing Machine

In this design, the user will be able to select the type of material to be washed, and the type of washing cycle. Use only 3 here:

1) Rinse (back and forth motion) 2) Wash (slow rotary motion) 3) Spin (fast rotary motion)

The cycle time will depend on the material. A simple melody will play when the cycle completes.

2. Parking Ticket System

This Ticketing System for a car park Uses a sensor to check whether a car is at the ticketing machine. When the driver presses a ticket button, a ticket will be issued, with an audible acknowledgement. Simulate the printing of the ticket by displaying the ticket on the LCD and turning on the lamp for one second. The ticket should have the time (hh:mm:ss) printed/displayed. A gantry will open to let the car in and close after it detects that there is no car at the machine.

3. Microwave Oven

The oven only provides for setting the heating time up to 60 seconds. This is done by keying in the time in seconds followed by '#' The user opens and closes the door by using buttons. A light turns on so the user can see the condition of the food. If the door is opened before the time is out, the oven has to be turn off. The turntable rotates to ensure even heating of the food.

4. Snack Dispenser

This device caters to people far away from shops and to reduce the cost of manning such remote locations. The display shows the snacks available and the price. The keypad allows users to select the food and the quantity. Upon selection and the quantity, the user puts in a cashcard and the amount is deducted from it. A rotary gear will push the required number of snacks to the user.

5. Lift Control

A 10 storey apartment requires a user panel which allows the users to select the floor they wish to go to. As the lift moves, the floor number is to be displayed. When the floor is reached, appropriate sounds and messages should inform the user that the destination is reached. There should be door close and open buttons. If there is no activity after a while the lift will go back to the first floor.

6. CD Juke Box A Jukebox has a selection of songs on various CDs that a user can select to play. The songs can be arranged into a playlist which contains the songs to be played. A CD should spin, somewhere in the process of composing the playlist. For this prototype, keep the songs to about 5 seconds or less!

7. Electronic Safe

Design an electronic safe that unlocks when the correct 4 digit code is entered. Disable the system for 10 seconds after 3 unsuccessful attempts. The door is opened and closed by pressing buttons. Use a visual indicator to show the status of the door. Use audible feedback for the various operations. Use an LCD to display appropriate messages.

8. Drink dispenser

With modern technology, automated drink dispensers can show pictures of the drink, guide the user and have a variety of beverage types, creamer/milk, sugar and temperature options. For example, looking at the features of a modern coffee maker can provide some ideas. You can use other types of drinks like tea, chocolate.

(Optional) 9. Analog-Digital Stopwatch

This stopwatch will have an analog movement that will correspond to the actual time displayed, in seconds.

The user can do three things with it.

1) Reset the count 2) Use as a normal stopwatch, with a start/stop feature 3) A count down mode where a time is given. There will be a beep when it reaches zero. The LCD will keep track of the time. The time should be accurate up to 0.1 second.

(Hints: The 'second' hand of a watch moves 6 ° (360/60) per movement. But the stepper motor only moves 1.8 °per step so it cannot step 6°. To compensate, we step the motor so that every 3 seconds it rotates 3-3-4 steps, corresponding to 5.4°/5.4°/7.2° - total of 18° which is the angle covered in 3 seconds.

Prototype Development Procedure

Hardware

The hardware required will be provided in the lab. It consist of a system with a 2 X 16 LCD and a 3 X 4 keypad. Use the D/A interface to provide sound and the stepper motor to indicate mechanical motion. At times, you may use the 7 segment LED for other visual operations. All inputs can be simulated by using the keypad.

Software

A demo software is provided to show the basic functions of the modules provided. The modules can control the LCD, stepper motor, speaker, keypad and LED.

You should make a copy of `demo.c` and rename it before make the necessary changes. However, do not make changes to any of the other files provided. This is so that there is common understanding of the functions of the modules and bugs and upgrades can be performed constantly. Look at the file `header.h` for a summary of the modules that you can use.

Testing

All the hardware and software will be available for you to do your testing. You should be able to find some time at the end of your lab for this. In addition, some free access periods will be made known to you at a later period.

Graphics Interface

Laboratories 7 and 8 provide some simple examples of graphics interfacing. You should modify the interface to meet your requirements.

Ergonomic points (2 marks per point maximum unless otherwise)	Marking scheme for graphics interface
Consistency (interface behaves similarly for similar actions?)	
Simplicity (short actions, use familiar concepts)	
Human Memory Limitations (reduce number of steps)	
Cognitive Directness (how inituitive)	
Feedback (for user actions, long processes)	
System messages (informative, non threatening)	
Anthropomorphization (too user friendly)	
Modality (different uses for keys in different contexts)	
Attention (how are unusual situations alerted)	
Display issues (not complicated, is consistent)	
Individual differences (for expert/ new users?)	
Can use product without manual, instructions? (6 mks)	
Total (20 marks)	

Other features like: using synchronizing objects for coordinating multitasking.