DEPARTMENT OF COMPUTER SCIENCE
VOLGNEAU SCHOOL OF ENGINEERING
GEORGE MASON UNIVERSITY

SWE 621 - Software Modeling and Architectural Design

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Term Project: Green Zone Monitoring System

Your group has been assigned to a project to design a client/server system for a Green Zone Monitoring System. Your group has been given the problem description for the Green Zone Monitoring System (see below).

The system is to be developed in two phases as follows:

Term Project: Phase I

For Phase 1 of the project, you are required to develop:

(1) Requirements and analysis models of the system, which.include:

a) A Use Case Model, consisting of a description of the actors and use cases that fully define the system. Each use case is described in terms of the actors and their interactions with the system.

b) Develop a System Context Class Model depicted on a class diagram showing how the system interfaces to the external environment.

c) Develop a static model showing the entity classes in the system, attributes of the classes, and the relationships between them.

d) Develop interaction diagrams (one for each use case), using either collaboration diagrams or sequence diagrams, depicting the sequence of interactions among the objects participating in each use case. Describe briefly the objects participating in each interaction diagram, identifying the object structuring criteria used.

e) For use cases involving entering and leaving the green zone, show the statechart as well as the interaction diagram for each use case. Make sure that each statechart is consistent with the appropriate interaction diagram.

e) Develop message sequence descriptions, describing the object interactions on each interaction diagram depicted in (1d) above.

State any assumptions you make.

Term Project: Phase II

For Phase II of the project, you are required to develop a Design Model for the Green Zone Monitoring System. In particular:

a) Develop a consolidated collaboration diagram(s) showing all the objects and message interfaces in the system.

b) Define the subsystem architecture, (depicted on a concurrent collaboration diagram), showing the clients and server of the system. Define the message communication interfaces between the clients and server.

c) Define the task architecture (depicted on concurrent collaboration diagrams) showing the concurrent tasks in each subsystem and the interfaces between them. Describe the criteria used for task structuring. Define the message communication interfaces.

d) Define the information hiding classes in the system. Define the operations of each class. Define the class interface specifications for the information hiding classes in the system.

e) Develop a task behavior specification for each concurrent task in the system, showing how each task responds to the inputs it receives.

State any assumptions you make.

GREEN ZONE MONITORING SYSTEM

PROBLEM DESCRIPTION

A modern city has decided to create a green zone. The green zone is an area in the center of the city in which there is restricted access by motor vehicles. Vehicles (such as cars and trucks) are only allowed to enter the green zone if they have a green zone permit. The permit number is encoded on a bar code sticker, which is displayed on the windshield of the vehicle. When the vehicle enters the green zone, a remote laser scanner reads the barcode permit number and transmits it to the Green Zone Monitoring System. When the car leaves the zone, its bar code is also scanned and sent to the system.

The system maintains a database of pre-paid green zone permits, from which the owner of the vehicle is billed for each trip and for the duration of the trip. There is a maximum charge for each day. The amount billed varies by time of day: peak-time, off-peak and night, and vehicle category, such as car, SUV, truck, taxi, bus, etc… The amount is deducted from the pre-paid green zone account at the end of each green zone trip. A person that resides in the Green Zone and has a vehicle registered in the same address needs to apply for a resident permit, which allows unrestricted access into and out of the Green Zone.

If the car does not have a green zone permit, then a video camera takes a picture of the vehicle license plate. From an external vehicle license database, the address of the vehicle owner is determined and a fine is sent to the driver.

The system includes an automated vehicle license recognition capability, which decodes vehicle license photographs taken by the vehicle camera. The system is also accessed by Green Zone operators who may view information about green zone permits and accounts, green zone trips, monitoring points, and vehicle fines.

The order of the sensors at the green zone entry and exit points is vehicle location sensor (which detects the presence of the vehicle), vehicle laser scanner, and vehicle camera.

For the software design (Phase 2), you may assume that each of these sensors is asynchronous. You may assume that there is a microcomputer at each entry point and each exit point, to which are connected the vehicle location sensor, vehicle laser scanner, and vehicle camera. You may also assume that there is one centralized server, which stores all the system information in a database.