E 322 DESIGN 6 - SMART PARKING SYSTEM HW6

Functionality of the overall system:

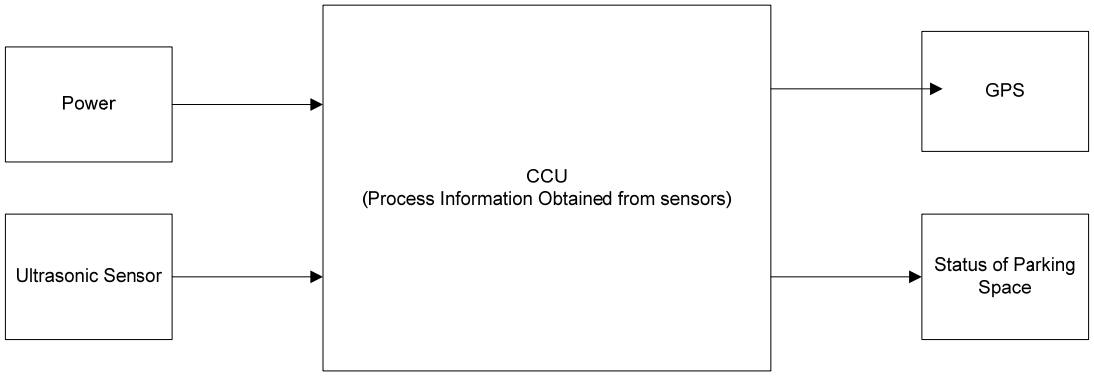
The main function of the system is to assist the user to find empty spot in a parking area with the help of GPS technology. Most of the smart parking system developed today utilizes visual aids as a mean to guide the user to a specific available parking spot. This includes LED panels and LED indicator lamp. The problem that we spot when using this method is the complexity in term of connection that it would have in the overall system. Since the system is already comprises with networks of sensors, adding another mesh network for the visual aids would not be that practical. This would then give rise to possible problems in the future such as circuit or device malfunctioning (bad LED panel), bad network wiring and system noise generating. In fact, for us, giving more networks (mesh-wiring) in the system increases overall power consumption because the type of wire needed is typically ohmic. Furthermore, if one of the connections in the mesh-wiring fails, then it would be very hard to spot the cause of the failure. This resulted to the suspension of the whole system which is inconvenient. In addition, extra time, labor and money are needed to run the maintenance.

For those reasons, we are trying to develop new method to convey the information to the user without the need of visual aids as described before. We are trying to integrate GPS system which can be performed in recent GPS device platform or an Android platform through upgrading. The GPS system would be in the form of wireless signal and therefore would replace the mesh-network wiring for visual aids. We are optimist that the system would be efficient than the previous system.

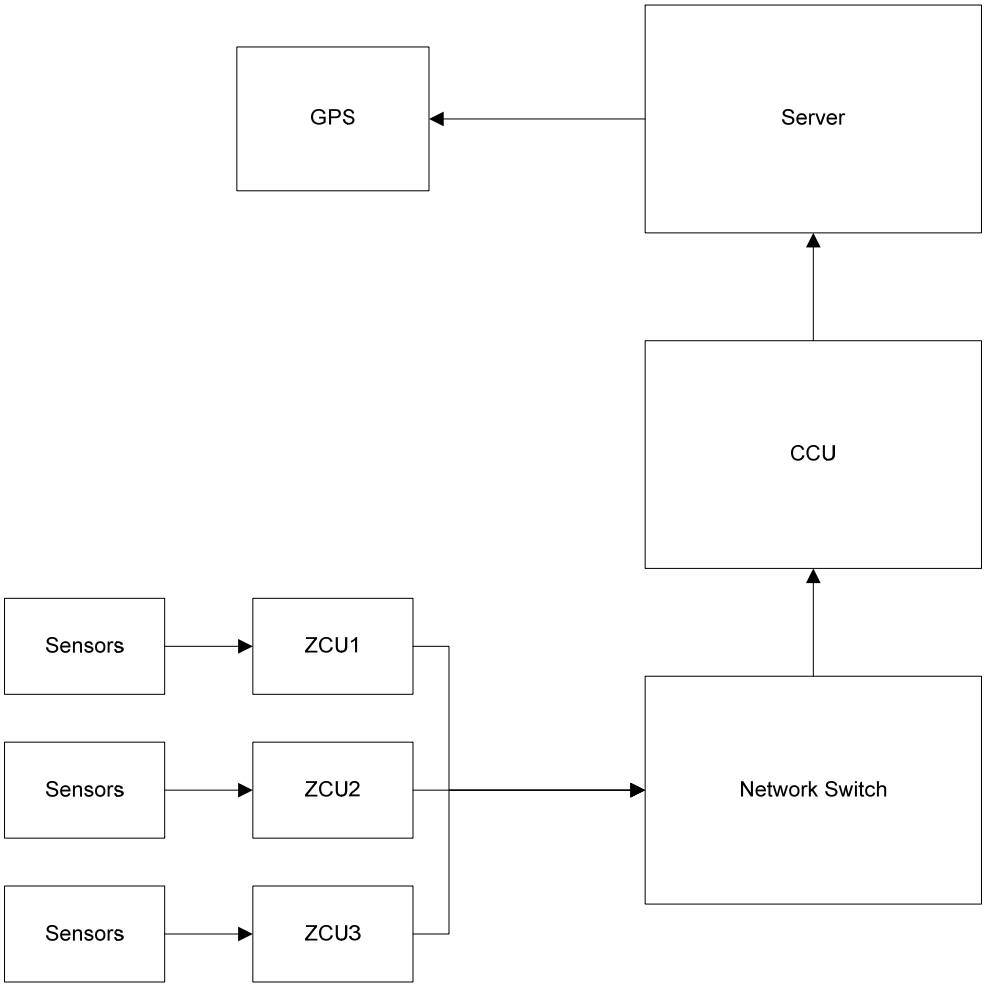
For our system, the whole operation relies on the central control unit (CCU). The CCU defines the action that should be taken in response to the input signals from the sensor. Then, we have the zone control unit (ZCU). Basically the purpose of the ZCU is to connect multiple sensors using multiple ports. They can be assumed as integral part for sensors in the zone level. Therefore, more sensors can be attached in different place by using ZCU. For example, multiple sensors can be attached on different floor of a building (parking lot). The main component of the system is the sensor. The type of sensor that we are using is the ultrasonic sensor. It is used to detect the presence of object (in this case car) on a specific area. It helps to determine the status of the parking area and the number of empty spaces. Signals form the arrays of sensor are fed to the ZCU and from there, they are accumulated in the CCU to be processed. The CCU is also capable to select data and store them in the server. The information stored in the server might be history data such as log files, buffer for future actions or previous software version. It also stores monitoring software for the whole system. The CCU then sends the processed data to the GPS module via wireless connection. The user retrieves the data from the system and interfaces them in their GPS module.

Detailed functions for individual components will be described in the next section.

Black Box



Interfaces Between Components



System Components

Main components:

1. **Central Controller Unit (CCU)**

- Central controller of parking guidance system. Main module in the system.
- Responsible for data collecting and data processing.
- Gets information from Zone Controller Unit (ZCU) and sends feedback to peripherals.
- The core of whole system, is mainly responsible for the collection of carport information and data processing of the whole yard, then send feedback of the processing data to the specific PCs or other relevant equipment such as GPS Navigation System.

2. **Zone Controller Unit (ZCU)**

- Zone Control Unit of parking system. The LCD in ZCU is to show the detector's work status.
- One Zone controller can connect to predetermined (40 to 60 ultrasonic detectors.
- Main function is to request information from the UD sensor, and send the data to CCU.
- It gathers and forwards vacancy information from all the UD sensors to the Central Control Unit.
- Forwards commands from the Central Control Unit to the specific PCs or other relevant equipment such as GPS Navigation System.

3. **Ultrasonic Sensors**

- An ultrasonic proximity sensor will be placed on the pavement (for outdoor parking) and on the parking spot (for indoor) for each individual parking space.
- When this sensor is blocked within a particular time limit (15-30 seconds), it will register that a vehicle is parked. The sensor will send this information to the server. The server then change the status of that particular parking space as 'occupied'
- When the sensor is not blocked within a particular time limit (2-3 minutes), it will assume that there is no vehicle in that parking space. This information will be sent to the server and the server will change the status of that parking space to 'available'
- All these information can be viewed via the parking application in the GPS
- This method requires a lot of sensors. It would be quite difficult and costly to set these sensors at every place.

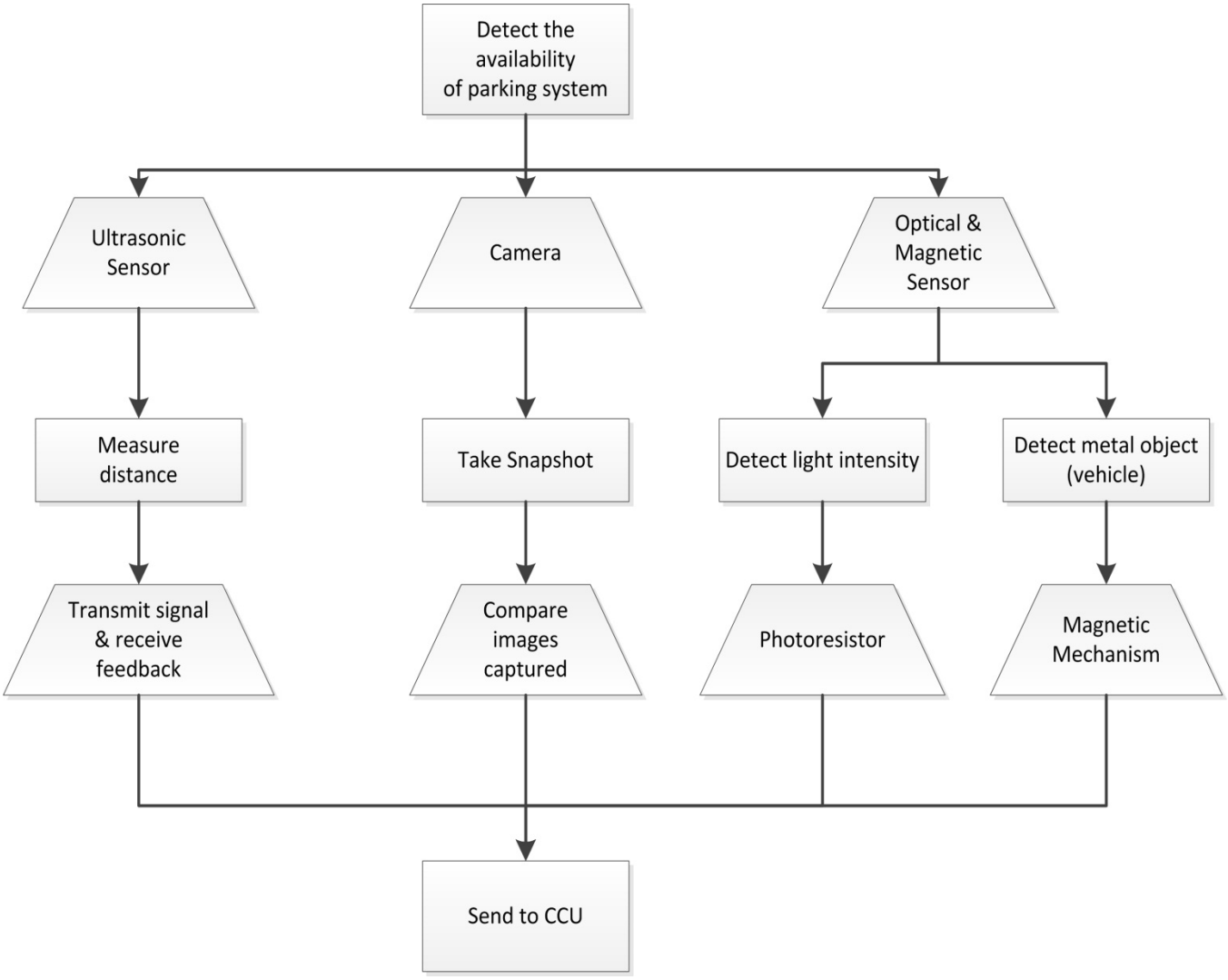
4. **PGS software**

- Monitoring the parking in PC and get the operation data.
- Customizing the UD sensors

5. GPS navigation System

- Receive the information from the server about the parking availability and the direction.
- Instruct the user to vacant parking space.

Function-means tree diagram



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Other links:
ZPU,CCU system:
http://www.ssspl.org/uploads/Products/Pdf/ParkingGuidancesystem.pdf
http://www.bikudo.com/product_search/details/292037/car_parking_system_led_display.html