Palestine Polytechnic University
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BMS: Building Management System

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bms
building management system
green + wired

Project Description

The Building Management System allows users to monitor and control several aspects of their buildings from a central or remote location through a mobile, voice and wireless remote. A user can also automate tasks such as heating, air-conditioning, and lighting control based on readings from one or many wireless and wired sensors.

This helps maintain a safe environment with regards to fires, gas leaks, and unauthorized access to the building area. The smart grid allows control over all electrical nodes manually, and automatically, based on an event system. This wireless sensor network and automation system makes it easy for users to manage their buildings and increase awareness about normal living experiences.

This cost-effective system also has the capability to optimize and properly manage electrical appliances, and effectively cut the cost of running using monitoring, control protocols, and software algorithms; a system that properly and effectively transfers the living experience towards the 21st century.

The Project has following Goals:

- Make the software as flexible as possible
- Design and implement a controller capable of running a smart grid.
- Design and implement a small scale sensor network.
- Design and implement software algorithms capable of making efficient decisions in absence of the user.
- Design and implement an attractive graphical interface for the software components to focus on the entertainment aspects of the system.
- Implement a voice recognition mechanism for easier control.
- Interface and implement a remote control mechanism with a wireless remote control device.
- Extend the system's capabilities by interfacing wireless nodes.
- Extend the system's control by using the SMS messaging service
- Design and implement a database for storing the data state of the system.
- Design a testing mechanism to insure software and hardware components viability.

User Interface

One of the major Goals for this project is to provide an attractive, relatively easy to use, and friendly Graphical User Interface. And So, the .Net Windows Presentation Foundation API was chosen for the system graphical design. As shown the figure below
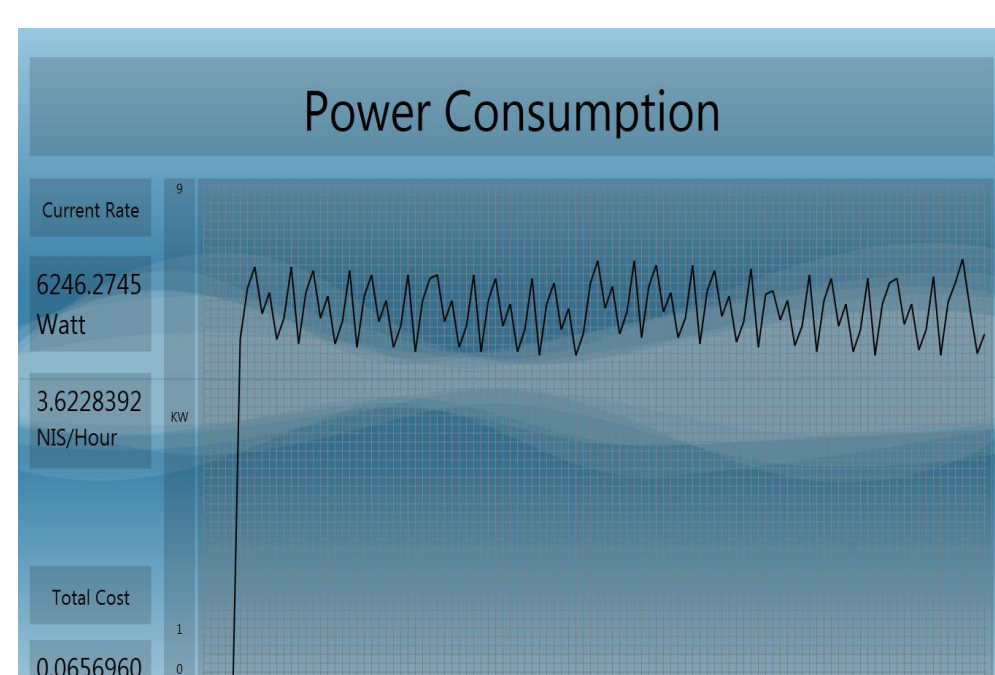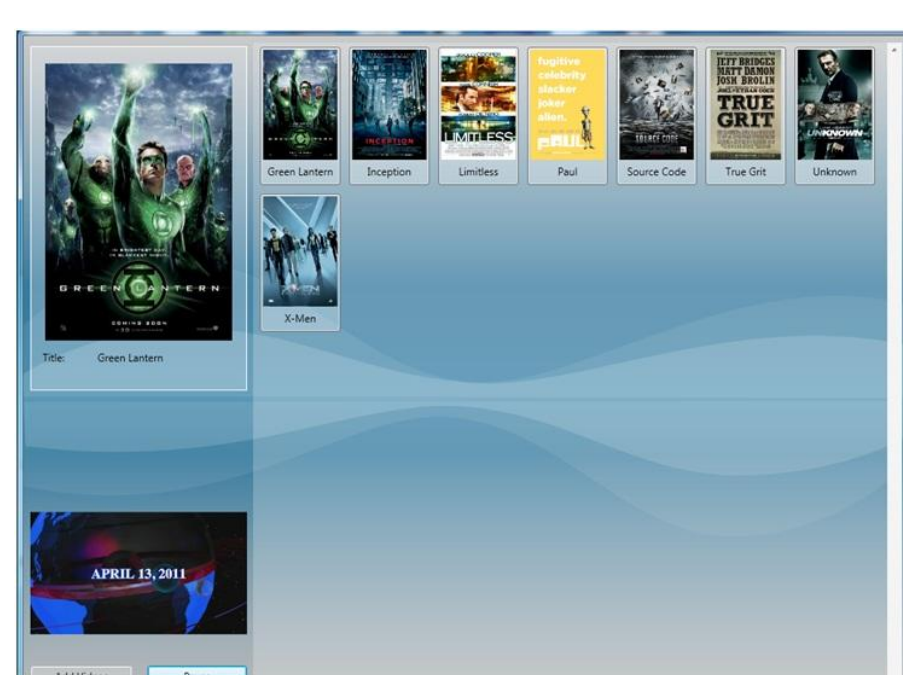
System Components

The system contains the following components each developed as its own subsystem:

Hardware Components

Main Controller, extends the computer capabilities via USB, and it controls 64 Digital Switch; Moreover it introduces input from a 24 digital sensor, and 16 analog sensors

ZigBee Wireless Controller and Routers: extends the system control wirelessly; where each router can control 12 Digital Switch, and handle 6 analog sensors.

Sensors: all working on a 0 to 5V analog DC signals, the following are introduced to the system: Power, Temperature, Water flow, Gas Sensors, Lighting, and Presence Sensors

Other Hardware include, a GSM Modem, audio splitters, video splitters, Microphone array, Remote Controls, a mobile phone, Relays, and LCD Screens

Software Components

Mainly Include the following:

Hardware drivers, Voice Recognition Modules, SMS and Serial Modules, Data and Database Modules, GUI Modules and the Event System, to produce actions and events for the hardware

Hardware System

The system can be modeled as a set of subsystems and the relationships between them, each subsystem must have the least amount of dependency, so in general it can be can presented as illustrated in the figure below:
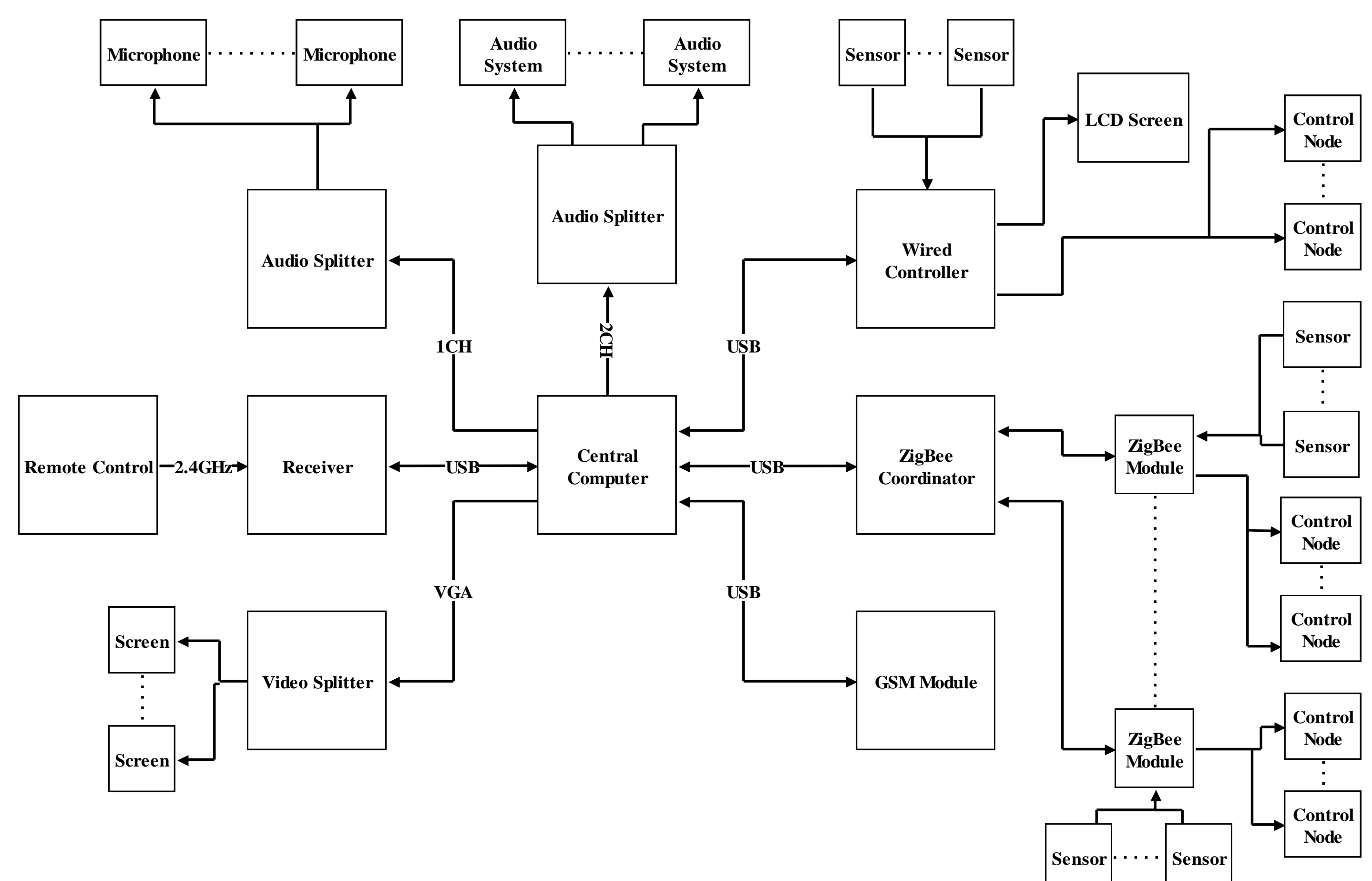
Software System

The software can be modeled as a set of objects each performing a specific task with disregard to the main logic. it is taken in regards that each subsystem must have the least amount of dependency, so in general it can be can present as shown in the following figure.
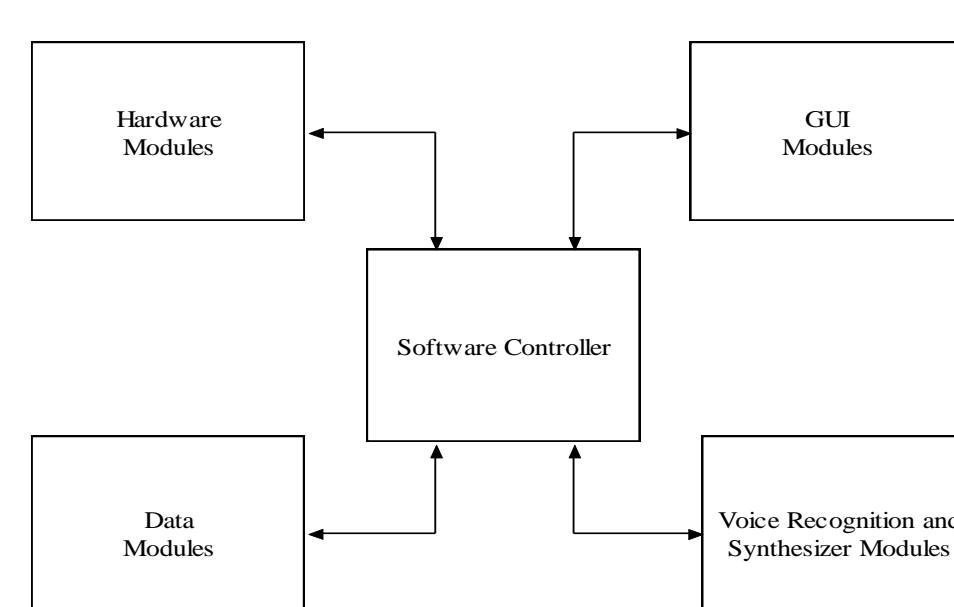
Software Controller

The main software logic behavior is summarized in activity diagram to the left, it presents the initialization techniques and the running state of the software components

These Components include, a GUI, a Voice Module, Hardware Drivers, and Data Modules.