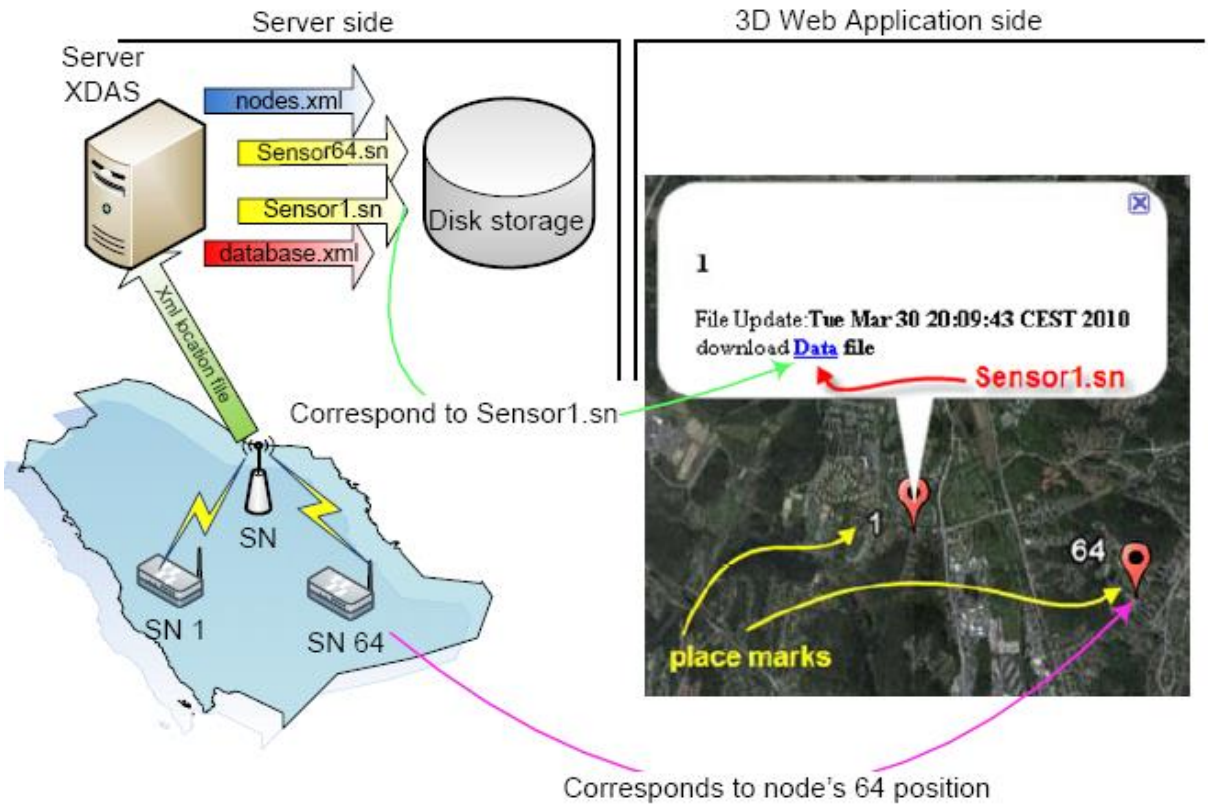
My best projects

Project 1 (Master's thesis): Monitoring Sensor Nodes Using Google earth and Distributed Group Communication File Transfer Applications.

Abstract

The purpose of this master thesis is to describe a software suite project that allows remote visualization, monitoring and data acquisition from sensor nodes that could be scattered over a vast geographical area. Also, it describes a rather a distributed algorithm which allows users to join groups and share the same set of files within a group with other member. Thus, the concept of group communication is extended to develop a distributed group communication file transfer application. Consequently, the main objective behind this work is to allow individuals to monitor sensor nodes from any place in the world using the comfort of their web browsers, and to download data files from those nodes without the burden of physical presence near them, as well as the development of a reliable distributed group communication file transfer application or protocol that allows users within a group to share same set of data files related sensor nodes with other group members.



Project 2: PIC Microcontroller TCP/IP SERVER

Description: In this project I have programmed a PIC microcontroller to communicate with the computer using TCP/IP sockets. At the initial stage of the design, I have decided to make the PIC microcontroller as a web server, where one could access a website uploaded onto this device using any web browser. The web browser connects to the device using its IP address, which I have chosen to be in the same subnet range as the user computer, and port 80, which is the standard port for web servers. However, the port could be changed to the user desire, but of course it should be within the range of 1 to 65536. I have programmed the PIC microcontroller using microC and wrote the necessary html webpage that allows me to interact with the PIC microcontroller using http protocol to send commands to the microcontroller, which in turn controls another electronic board according to the commands the user send.

I have designed this project for the company that I have previously worked at(www.ekt2.com). The whole idea was to be able to change the currency exchange status of a big electronic board from any place in the network, and eventually in the world, using a computer graphical interface, see Fig 1. I have taken the project one step further, and instead of designing the whole graphical user interface in html, I have decided to mimic the real electronic board using C# programming language to design the GUI (Graphical User Interface). Consequently, I have designed a program in C# that has the same visual style and fields of the electronic board desired to be controlled, see Fig 2. In this new configuration, the program at the computer terminal acts as a server with GUI to which the PIC microcontroller connects as a client using either TCP or UDP. After the user changes the currency fields in the GUI at his computer terminal, the changes will be transmitted using TCP/IP protocol suite to the microcontroller, which could be anywhere on the network. The microcontroller then communicate serially with the big exchange board (1.8 m x 75 m) and updates the board with the data that it received from the user.

Figure 1 Software designed

Project 3 (Bachelor's Thesis): Design of hardware/Software for real time monitoring of ECG

Description:

- **Hardware:** This is by far the largest project I have worked on because it involved a lot of research in the medical field, electronic field and programming field. In this project I have designed an electronic circuit (fig1) for capturing the ECG .Electrocardiogram (ECG or EKG) is the abbreviation for electrocardiogram, a record of the electrical impulses that immediately precede contraction of the heart muscle. It is a surface measurement of the electrical potential generated by the electrical activities in the cardiac tissues. This valuable and non-invasive tool doesn't require any incision or cutting through the human body.

- **Software:** Also I have designed a huge software application using Java to render the captured ECG waveform on the screen of a computer in real-time. The software allows the user to capture the analog electric waveform using a microphone plug as an input to a microphone jack of a notebook. In doing so, I have harnessed the power of the sound card of the computer, which gives me a range of sampling frequencies, instead of using the analog to digital converter provided as module on the PIC. For capturing the sound or the analog waveform I have used java sound API. After digitizing the signal, the computer renders the waveform in real time on the screen. Moreover, the program has three panels(fig 4). The first panel is used to input and display some information about the patient and the length of the ECG waveform. In this panel, there is also a sub panel ,which allows the user to take a snap shot image for his face from a camera using JMF(Java Media FrameWork) package. The second panel allows the user to see the waveform in real-time, and displays the heart rate. The third panel controls the time scale and amplitude of the waveform. After the patients records his/her ECG he can save it, along with some information about himself, and his image in one file with .ecg extension. The saved file can be sent to his/her doctor or viewed later in a new panel (fig 5), which allows some signal processing such as an average filter.

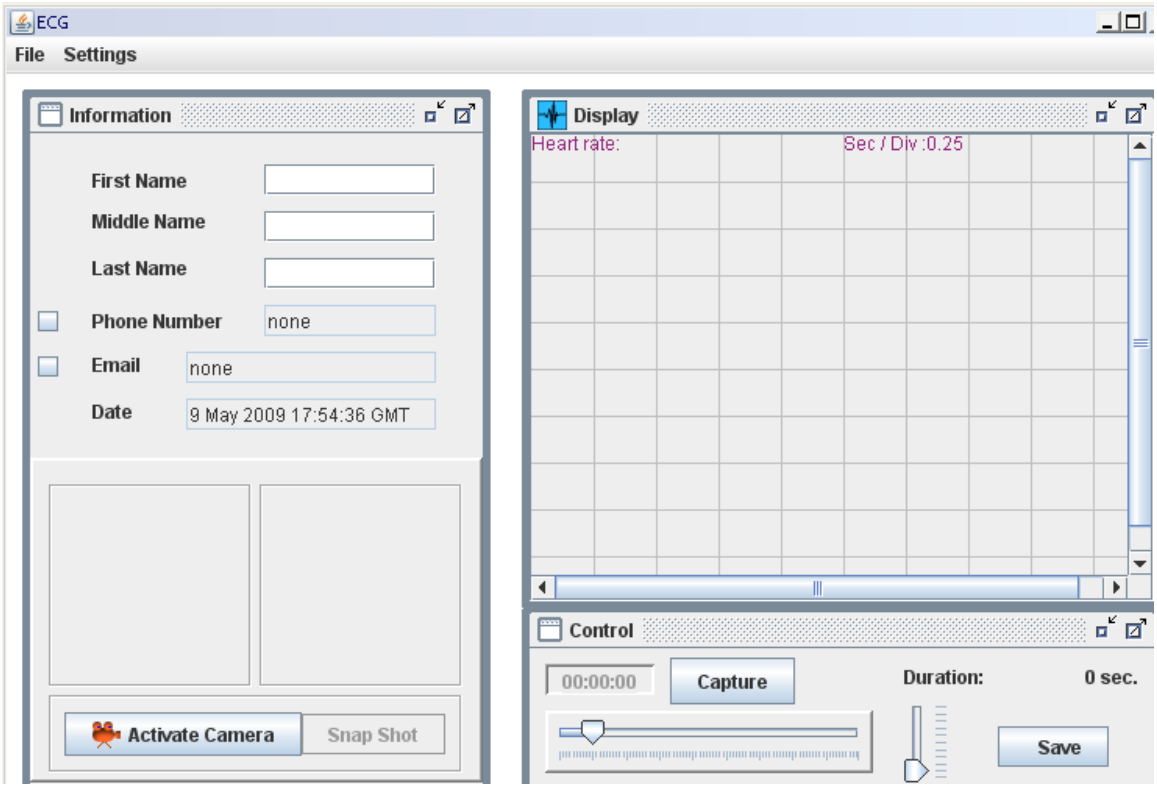


Figure 2 Software real time panel

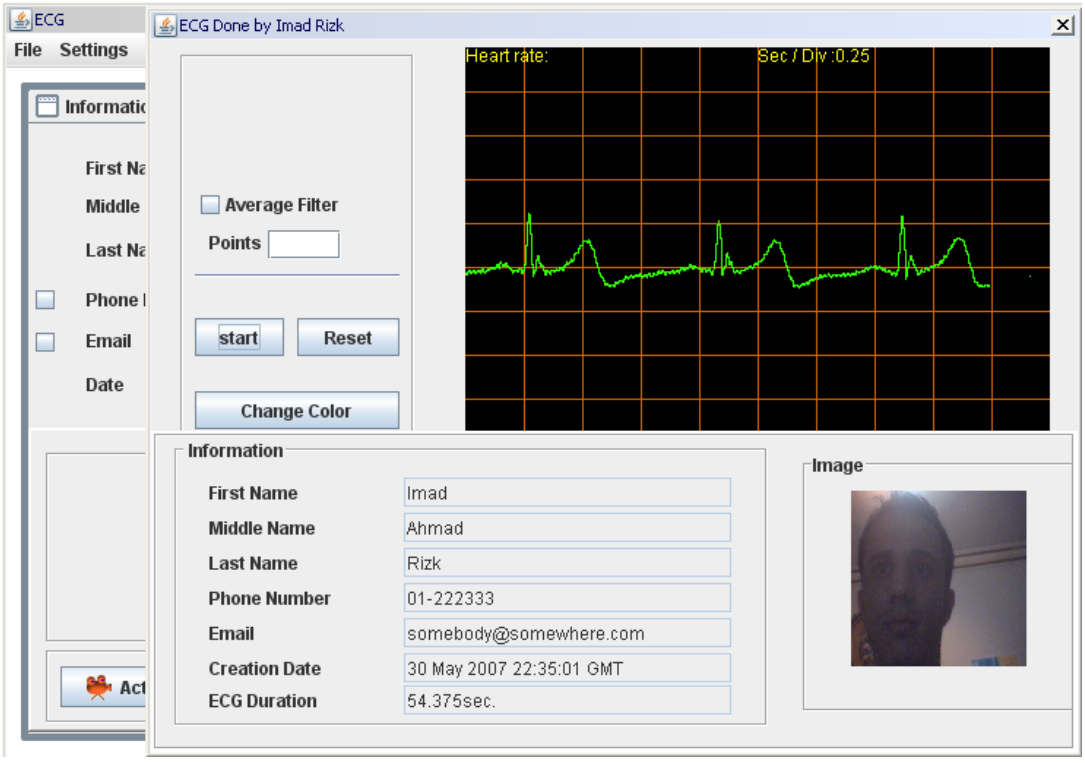


Figure 3 Software panel for opening saved files