

The objective of my thesis is to design and build a device which is able to measure a person's EKG signal and determine their geographical position. The device is also required to send these data to a server via Internet.

The system consists of two main modules, a circuit which is responsible for the localization of the person, the amplification, transformation and wireless transition of the EKG signal, and a PC module which is responsible for the processing and evaluation of the incoming data.

The circuit can be decomposed into four different parts according to the functions they provide. So the circuit consists of an EKG measurement and gain module which is responsible for measuring and gaining the EKG signal, a GPS receiver to take the signal information, transmitted by the GPS satellites, and use triangulation to calculate the user's exact location, a GPRS module which provides connection between the device and the server, and finally an MCU.

The operation of EKG module consists of four stages. In the first stage an instrumentation amplifier gains the approximately 1 mV EKG signal. In the second stage this new gained signal will be removed from its DC component using with a high pass filter. In the third stage the signal will be gained further. In the final stage the signal is filtered by a low pass filter in order to get rid of its high frequency components.

This gained and filtered signal is sampled by the Texas Instruments MSP430F2617 MCU. The MCU sends this signal to the AirPrime Q2687 GPRS module using a serial protocol. The GPRS module transmits not only these signals to the server but also the GPS signal information coming from the SUP500 GPS receiver.

These data are processed by a PC application running on the server. Because to the low pass filter remove only the high frequency hazards form the EKG signal($f > 1\text{kHz}$) the low frequency hazards(50 Hz network disturbance and its overtones, and hazards coming from the muscle quakes) need to be filtered out by the PC digitally. The second task of the software to display the current position of the user according to the GPS coordinates.

So far I've finished the system design, and I've selected the appropriate components of the system as well. A prototype of the device also has also been made. With the help of the prototype I was able to start to developing the embedded software of the device.