Microprocessor Systems

Automated Greenhouse & Monitoring System

Alexandru ANTOCE **Elvis CARAMETE**

1) User Requirements

2) System overview

3) Hardware design

4) Software design

5) Repository

1) User Requirements

a) The system **must** provide information relevant to air temperature, air humidity and soil moisture (humidity) when **requested** by user.

b) Temperature and humidity information **should** be accessed via a **mobile application.**

c) The system **must** provide the current air temperature, soil moisture and air humidity.

d) The system **may** provide access to history data.

2) System Overview

The overview of the system is illustrated în **Figure 1.**

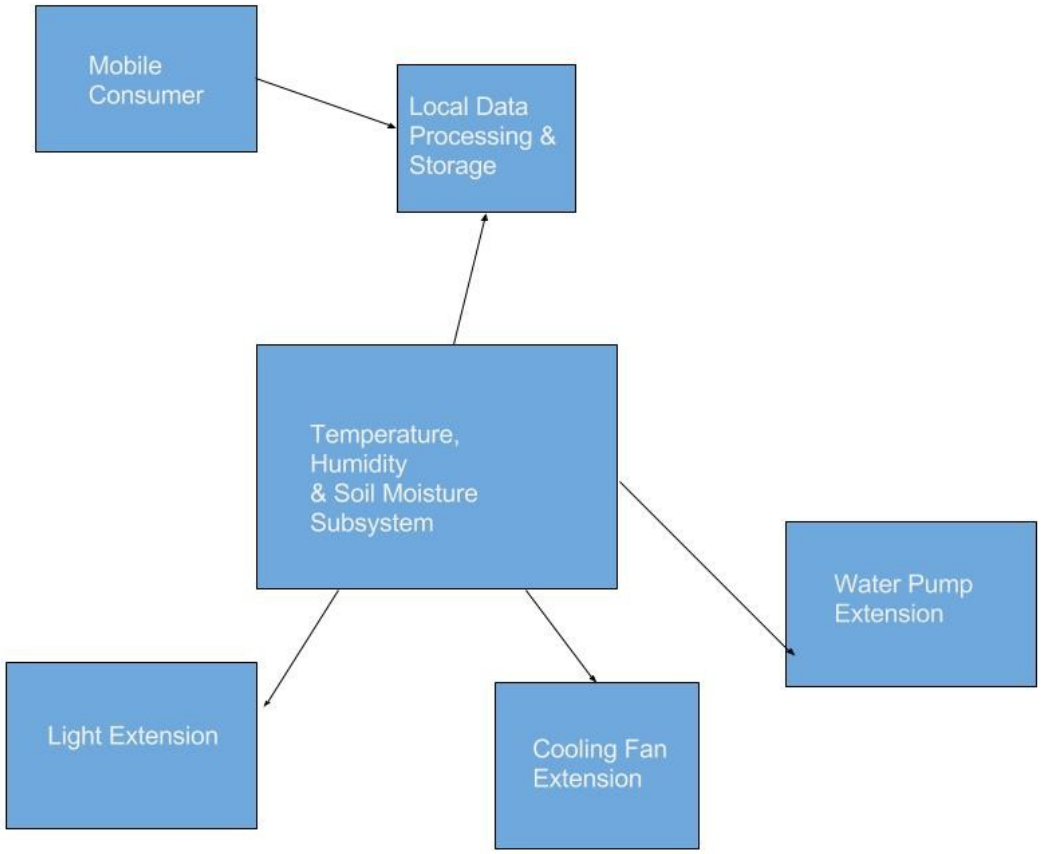

Figure 1. System overview

The base subsystem (which is composed of temperature, humidity and soil moisture monitoring system) encompasses the measurement and data processing functionalities. The purpose of this subsystem is to acquire informations from the sensors and to process the data obtained from these sensors.

Light extension provides an interface for light related data. The user might

turn light on or off and the subsystem must notify user about light related changes.

Cooling Fan extension provides the user with the possibility to manually adjust the speed of a cooling fan in order to decrease the temperature inside the greenhouse. The cooling fan can also be automatically turned on by the base subsytem, based on the data provided by the temperature sensor, in order to decrease the interior temperature of the greenhouse.

Water Pump extension provides the user with the possibility to manually turn on an irrigation system, in order to supply water to the plants. The process of supplying the plants with the necessary amount of water can be automated by the base system in the following way: the base system receives soil moisture percentage from the sensors and controls the water pump accordingly, until it reaches a soil humidity threshold imposed by the user.

The Local Data Processing and Storage Subsystem stores the data pushed by the **Base Subsystem**. Additionally, it offers a possibility to process stored information and further send the data to the user.

Mobile consumer provides a view representation for the stored data. The view will
be accessed via a specialised application which runs on a mobile device.

3) Hardware design

Raspberry Pi 2 provides support for quick prototyping. That makes it a perfect choice for
quick prototyping but not adequate for real-time applications. We will use the one-wire
interface it has, but also the implicit possibility of communicating with other devices over
the Internet.

DHT-11 is an one-wire enabled sensor. It is a basic, digital-output relative temperature and humidity sensor.

We also use a **generic soil moisture (humidity)** sensnsor with digital output, which makes it perfect to keep under control the moisture of the soil.

There are 3 relays (5v controlled) which can be used to extend the system for controlling a water pump, a cooling fan and a light

4) Software Design

Server_socket.py: it retrieves the temperature and humidity tuple from DHT-11, it retrieves the soil moisture from the generic sensor, it controls the cooling fan and water pump and it also can control the light.

Android application: it sends data to the python server which is located on raspberry, it can activate the water pump or the cooling fan, it can activate the ip-camera through the web sockets. On the application, we can see in real time results from the sensors.

5) Repository

https://github.com/ElvisCaramete/Micropocessor-Systems