ADAPTIVE IRRIGATION CONTROL

Team Name: Farm Hack

Srinivas Piskala Ganesh Babu, Abhishek Kumar, Mohammed Shamshuddin Shaik

Abstract :

An Efficient Water Management (Farm Based) System for Various Crops based on the Requirement, Climatic Conditions, and other factors.

The Projects accomplishes,

- Efficient usage of water in the Farm Field
- Calculates the exact amount of water required by the Plant (Not more not less)
- Efficient prevention of Intrusion near the Crops
- Increases the yield of crops by reporting data regarding the Light, Climatic conditions in atmosphere and soil thereby indicating the required changes
- Data Analysis of the habitat of crops – the more device is used the more it makes the growth efficient
- Everything brought to the palm of Farmer's hand or ear using application/Alexa respectively

Introduction :

The AWS loft created an environment to trigger innovation in us. Initially with no prior ideas we started to brainstorm and ended up in a project to protect the Plants in Farms as well conserve water. Thanks to the theme #HackThePlanet and the Vegetarian/Vegan food which motivated us to think with a high respect regarding the plants that feed us. Considering the conservation of water which our Planet is desperately craving in we prevent the wastage of water as well with efficient usage (not more not less) there by assuring no damage to the crops.

To promote the plants to thrive in the field as well as to drastically increase the yield and efficient growth in "Organic Manner" we consider the historical habitat data of the plant and ensure the right conditions by measuring the Moisture in the Atmosphere and Soil, Temperature, exposure to sun light. Additionally, based on a survey with some committed kitchen gardeners motion sensing is done in proximity to the crops to detect any intrusion and notifying the user. The User gets notified with an app or Alexa notification and a buzzer for all the data at a threshold level.

The Problem:

- Water an essential resource is to be conserved and used efficiently – Absence of proper Irrigation system
- Fuel used in a Irrigation System
- Watering the plants and sometimes leading to damage of crops with more or very less water levels.
- Wasted yield due to intrusion near the plants (especially Animals)
- Fertilizers used heavily to promote efficient growth and yield in contrast to organic growth
- No Data on the Habitat of crops considered to make key decision in the crop life cycle

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The Solution:

- Ensuring a proper irrigation system by conserving the water and effectively using it
- Usage of Fuel to Zero using IOT AWS device
- Analyse Plant Species Data and protect plants by ensuring right amount of water
- Protect the Yield by ensuring an intrusion detection system
- Proper eradication of excess water
- Analyse the Habitat data of the crops growing in different climatic conditions based on the usage of the device and providing hints to make a better decision

The Effect:

- Healthy Human beings like before – Organic food
- Extend lifespan of our Planet by effectively using water
- Reduction in the use of non-renewable resources
- Effective yield to support the demand

The Future:

- Analyse the Plant Habitat data collecting the behaviour of plants at various climatic conditions and effectively bringing about some changes by making wise decisions with the data collected in the span of the device usage

The Tools Used:

- Intel Edison and Grove IOT Starter Kit Powered by AWS
- Language – Javascript
- Alexa / Android Application

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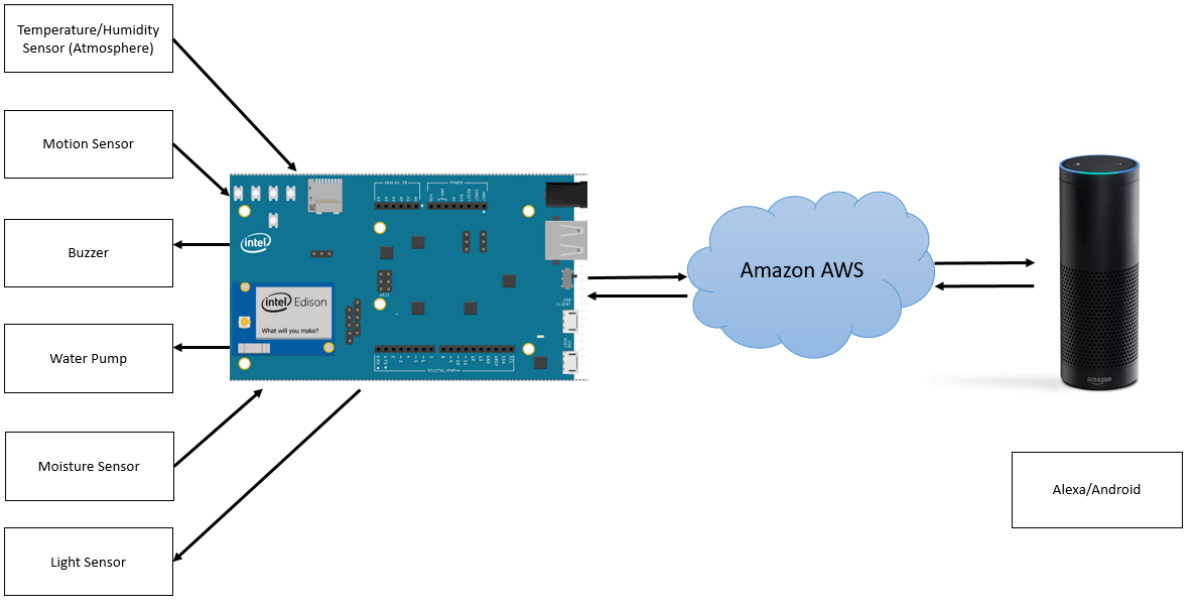
The Schematics:

- ## Block Diagram



- ## Code

The IOT device code is as follows

```
/*
    * Copyright (c) 2015 - 2016 Intel Corporation.
    *
    * Permission is hereby granted, free of charge, to any person obtaining
    * a copy of this software and associated documentation files (the
    * "Software"), to deal in the Software without restriction, including
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```

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```
* LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION
* OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION
* WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
*/

"use strict";

// The program is using the Node.js built-in `fs` module
// to load the config.json and any other files needed
var fs = require("fs");
var awsIoT = require('aws-iot-device-sdk');
// The program is using the Node.js built-in `path` module to find
// the file path to needed files on disk
var path = require("path");
// Load configuration data from `config.json` file. Edit this file
// to change to correct values for your configuration

var mqttPort = 8883;
var certPath = '/home/root/';
var awsRootCACert = "root-CA.crt";
var awsClientCert = "farm_hack.cert.pem.crt";
var awsClientPrivateKey = "farm_hack.private.key";
var awsClientId = "farm_hack";
var topicName = "sensor_topic";
var privateKeyPath = certPath + awsClientPrivateKey;
var clientCertPath = certPath + awsClientCert;
var rootCAPath = certPath + awsRootCACert;

var device = awsIoT.device({
    keyPath: privateKeyPath,
    certPath: clientCertPath,
    caPath: rootCAPath,
    clientId: awsClientId,
    region: "us-east-1"
});

console.log("AWS IoT Device object initialized");

// Initialize the hardware for whichever kit we are using
var five = require("johnny-five");
var Edison = require("edison-io");
var board = new five.Board({
```

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```
  io: new Edison()
});


var grove_motion = require('jsupm_biss0001');
 // Instantiate a Grove Motion sensor on GPIO pin D2
 var myMotionObj = new grove_motion.BISS0001(2);


board.on("ready", function() {

    var moisture = new five.Sensor("A1");
    var moistureCond = "";

    moisture.scale(0, 100).on("change", function() {
        // 0 - Dry
        // 50 - Wet
        if (this.value < 20) {
          moistureCond = "dry";
        } else {
          moistureCond = "wet";
        }
    });

    var multi = new five.Multi({
        controller: "TH02"
    });


    device.subscribe('sensor_topic');


    this.loop(2000, function() {

        console.log("motion val: "+myMotionObj.value());
        console.log("Thermometer");
        console.log("  celsius           : ", multi.thermometer.celsius);
        console.log("  fahrenheit        : ", multi.thermometer.fahrenheit);
        console.log("  kelvin            : ", multi.thermometer.kelvin);
        console.log("------------------------------------");
```

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```
        console.log("Hygrometer");
        console.log("  relative humidity : ",
multi.hygrometer.relativeHumidity);



        console.log("-------------------------------------");

        console.log("being published");

        device.publish('sensor_topic', JSON.stringify({
            message: "Values recorded",
            SerialNumber: awsClientId+"#"+new Date(),
            clientID: awsClientId,
            temperature: multi.thermometer.celsius,
            humidity: multi.hygrometer.relativeHumidity,
            moisture: moistureCond,
            motion: myMotionObj.value(),
            timestamp: new Date()
        }));
  });

});
```

Conclusion:

The two days of Hackathon motivated us to learn a lot and come out with an initial prototype of our idea. Out of the many challenges we could come out with a prototype though not perfect, a functional model of where we were heading to.

Collaborated from the Hackathon we have built a prototype close to what we tried to achieve and further take this project to next level by enhancing them and bring about a big change in the Irrigation system of the Farms.

Thanks to Hackster.io for the opportunity and such a motivation past 2 days !