

Date: 20 Feb 2019

Start Time: 14:15 hours

Project Title: A Cyber-Physical approach for efficient Fertigation and Irrigation [efficient usage of fertilizers]

Motivation: Agriculture is the backbone of the Indian economy and contributes to about 17% of its GDP. Yet, the condition of farmers in India is quite poor. The main reason for this condition can be credited to the lack of information and the ability to process available information to make informed choices.

Recent surveys have listed the two major problems in the agriculture industry faced by farmers are as follows:

1. Lack of awareness on how to store the produce and losing the production.
2. Irrigation and fertigation but not at right time and in right quantities.

Proposed solution: The main objective of this project is to overcome problem #2 and to boost the output of each farm thereby uplifting the economic condition of the farmer as well as stabilize the food security of the country.

We would like to design a Cyber-Physical embedded system which monitors the crop conditions along with the environmental conditions around it to suggest the right fertilizer to be used ensuring millions of farmers to have information about the precise amount of fertilizer to be used for a particular soil condition.

Modeling: We consider the values from the humidity sensor, moisture sensor, water level, nutrient levels and outputs the quantity of fertilizer and amount of water to be used.

Designing: We design a system with respective sensors and actuators controlled by a microcontroller.

Analyzing: At the end, “A design without specifications cannot be right or wrong, it can only be surprising”. Hence we will focus on relationships between models and analyze the behavior of the system.

It's neither just a CPS nor just an embedded system. But it is...

A Cyber-Physical Embedded System. Let's look into why and how?

The above explanation makes it clear that the designed system has to interact with the physical environment continuously and get the information about soil and environment **which majorly acts as an input to the model of the system**. Since we are aiming for drip irrigation and efficient fertigation, we also need to consider the following physical properties such as slope **[for irrigation, in particular, for watering]** and nutrient levels including oxygen levels, nitrogen levels and **ph of the soil may be** to determine the precise quantity of fertilizer.

Ultimately, how efficient the models are can only be observed through the implemented hardware design which involves an embedded device/micro-controller to coordinate all the sensors and actuators accordingly **[may also be connected to cloud based on need]** and also **clearly, it is understandable that this system is designed to solve only the problem that is defined and has a limited number of use cases.**

With this, we can strongly say that it has to be called a Cyber-Physical embedded system but not anything else.