

## **PANSY: A Portable Autonomous Irrigation System**

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### **SUMMARY**

Generally, crop in a greenhouse environment is extremely sensitive and responds negatively to even the slightest of climatic changes. As such, an automated system of irrigation is ideal. Deployed effectively, intelligent wireless sensors can efficiently control the environment and irrigate as necessary. Smart wireless sensors provide an avenue to dynamically control the environment with little or no human intervention. In this paper, we introduce a wireless networked sensor system, PANSY, which intends to make crop irrigation efficient and labor un-intensive. PANSY effectively monitors the temperature, humidity, and soil moisture of a certain crop and its surroundings. If desired, sensors can monitor every plant in the greenhouse far more rapidly than traditional techniques, namely, human labor. In addition, each sensor can be calibrated to the specifications of a certain crop making the system universally useful. Such a system promotes highly accurate inventories, simple species location, and the elimination of pot bar codes. More specifically, PANSY provides a portable autonomous irrigation system. Experimental results confirm both PANSY's potential and current ability to produce crops equivalent to those produced by a professional grower. In fact, the plants grown by PANSY consistently out-performed traditional irrigation methods. PANSY is most beneficial when there is a shortage of water or treatment of chemicals as the PANSY system relies upon a more efficient model than the traditional professional and decreases chemical use.

*Key words:* Portable autonomous irrigation system, Wireless sensor network, Smart wireless sensors, Green house, Monitoring system, Automated system.

### **1. INTRODUCTION**

Agricultural systems are susceptible to dynamic environmental changes which need to be carefully monitored to insure the longevity and health of the crop. In general, crops require sunlight, nutrient rich soil and water for survival, all of which can be controlled within a greenhouse. However, fine-grain control of environmental factors in a modern greenhouse requires both physical labor and expensive monitoring systems. For example, a grower in a medium size greenhouse (about 5 acres) can spend between 4-10 hours irrigating crops every day, even with the assistance from an automated system. In current greenhouse applications human interaction is necessary to setup the irrigation system and may be required to initiate each irrigation cycle. The aim of this paper is to present an irrigation

system which reduces human interaction significantly. Intelligent sensors can be programmed to monitor the environment and irrigate crops when needed. This automated irrigation is ideal for a greenhouse application. By introducing smart wireless sensors into a greenhouse environment, the growth of the plants can be controlled with very little human intervention. This paper presents PANSY: a portable autonomous irrigation system that has the ability to monitor a minimal set of environmental elements and irrigate a group of plants depending on environmental conditions. PANSY has two main benefits: it reduces the amount of water given to the crop and reduces, if not eliminates, labor costs required to irrigate crops, thereby reducing a large cost factor in the production of most plants (Bartok 1974, Giacomelli 1994).

