E&T ENGINEERING AND TECHNOLOGY

Natural network and digital camera used to detect soil moisture

Researchers have developed a system for monitoring soil moisture, using just a standard digital camera paired with an artificial neural network.

With the United Nations predicting that many areas of the planet may not have enough fresh water to meet the demands of agriculture by 2050, more efficient soil irrigation could help to alleviate this upcoming problem.

The University of South Australia team found that current methods for sensing soil moisture are problematic, as buried sensors are susceptible to salts in the substrate and require specialized hardware for connections. Meanwhile, thermal imaging cameras are expensive and can be compromised by climatic conditions such as sunlight intensity, fog, and clouds.

“The system we trialled is simple, robust and affordable, making it promising technology to support precision agriculture,” researcher Dr Ali Al-Naji said in reference to his new machine learning solution. “It is based on a standard video camera which analyses the differences in soil colour to determine moisture content. We tested it at different distances, times and illumination levels, and the system was very accurate.”

The camera was connected to an artificial neural network which the researchers trained to recognize different soil moisture levels under different sky conditions. Using this network, the monitoring system could potentially be trained to recognize the specific soil conditions of any location. This allowed it to be customized for each user and updated for changing climatic circumstances, ensuring maximum accuracy.

“Once the network has been trained it should be possible to achieve controlled irrigation by maintaining the appearance of the soil at the desired state,” Professor Javaan Chahl said. “Now that we know the monitoring method is accurate, we are planning to design a cost-effective smart-irrigation system based on our algorithm using a microcontroller, USB camera and water pump that can work with different types of soils.

“This system holds promise as a tool for improved irrigation technologies in agriculture in terms of cost, availability and accuracy under changing climatic conditions.”

Taken from:

https://eandt.theiet.org/content/articles/2021/03/neural-network-and-digital-camera-used-to-detect-soil-moisture/

LIVEWORKSHEETS

Read the article and mark the sentences T (true) or F (false). Justify the false ones.

1- Researchers have developed a system for monitoring soil moisture, using just a nonstandard digital camera _____ _____

2- According to some researchers many areas of the planet may not have enough fresh water to meet the demands of agriculture by 2050, and more efficient soil irrigation system won´t alleviate this upcoming problem. ____ _____

3- Researches have found that current methods for sensing soil moisture aren´t problematic since buried sensors aren´t susceptible to salts in the substrate. ____ _____

4- Thermal imaging cameras aren´t cheap and can be compromised by climatic conditions such as sunlight intensity, fog, and clouds. ___ _____

5- This new system is simple, tough and affordable, making it promising technology to support precision agriculture. ____ _____

6- This new system is based on a standard video camera which analyses the differences in soil humidity to determine moisture content. ___ _____

7- The monitoring system could potentially be trained to recognize the specific soil conditions of any location and once the network has been trained it should be possible to achieve controlled irrigation by maintaining the appearance of the soil at the desired state. ___ _____.

8- Professor Javaan Chahl said that although they know the monitoring method isn´t accurate, they are planning to design a cost-effective smart-irrigation system based on our algorithm using a microcontroller, USB camera and water pump that can work with different types of soils. ___ _____

9- "This system holds promise as a tool for improved irrigation technologies in agriculture in terms of cost, availability and accuracy under changing climatic conditions." ___ _____

10- In your own opinion, will this new system be useful? _____

LIVEWORKSHEETS