Abstract

Knowledge Extraction, Sharing and Transfer from Physical and Human Sensors in Smart Agriculture

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In recent years, Japan's agricultural sector has been experiencing a decline in the number of people employed in agriculture and an aging of farmers. In addition, the knowledge of older, skilled farmers is being lost without being passed on to younger farmers. In response to these issues, smart agriculture is being promoted in Japan. Based on their abundant experience, farmers detect pests and diseases and changes in the environment of crops, and make decisions and carry out their work. Physical sensor data from the Internet of Things (IoT) is not sufficient to collect knowledge about farmers' decisions and operations. Therefore, it is effective to collect audio and images of changes in crops and the environment that farmers perceive while working in the field and during their work. In this research, we call these "human sensors. We propose a method to collect the information about the farmer's work using human sensors, and the changes in the crops and environment that the farmer perceives during the work.

We are planning to support knowledge sharing and knowledge transfer by collecting and analyzing the knowledge of farmers using a Smart Voice Messaging System and integrating it with environmental data around crops using physical sensors.

In this study, we used multiple regression analysis and decision trees to extract agricultural knowledge, and were able to extract knowledge about watering in planter cultivation. We were also able to confirm the effectiveness of the system as a work support, decision support, and learning support. For knowledge sharing and knowledge transfer, we conducted an experiment at an agricultural field, and conducted a workshop to reflect on the results of the experiment using human sensor data and physical sensor data. In the second experiment, we were able to share and pass on knowledge about water management. Furthermore, we were able to clarify four aspects of effectiveness: effectiveness as a recording and countermeasure, effectiveness as a clarification of teaching methods, effectiveness as a decision-making support, and effectiveness as a learning support. For the third session, we were able to share and pass on knowledge

concerning the judgment of where to harvest turnips and the shape of the ridges. In addition, two aspects of effectiveness as decision-making visualization and effectiveness as work support were also clarified.