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Improvement of JXTA-Overlay P2P Platform: Evaluation for Medical Application and Reliability

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ABSTRACT

JXTA-Overlay is a middleware built on top of the JXTA specification, which defines a set of protocols that standardize how different devices may communicate and collaborate among them. JXTA-Overlay provides a set of basic functionalities, primitives, intended to be as complete as possible to satisfy the needs of most JXTA-based applications. In this paper, the authors improve the reliability of their JXTA-Overlay P2P platform by implementing a new fuzzy-based Peer Reliability (PR) system. In the system, the authors considered three input parameters: Local Score (LS), Security (S) and Number of Interactions (NI). They evaluate JXTA-Overlay platform for medical applications and reliability. The experimental results show that by using JXTA-Overlay is possible to decide the situation of the patients. The simulation results have shown that the proposed system has a good performance and can choose reliable peers to connect in JXTA-Overlay platform.

Keywords: Fuzzy Logic, JXTA-Overlay, Medical Applications, P2P Systems, Peer Reliability

INTRODUCTION

The Internet is growing every day and the performance of computers is increased exponentially. However, the Internet architecture is based on Client/Server (C/S) topology, therefore cannot

use efficiently the client's features. Also, with appearance of new technologies such as ad-hoc networks, sensor networks, body networks, home networking, new network devices and applications will appear. Therefore, it is very important to monitor, control and optimize these

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- **Heater Function:** The heater function maintains the temperature to be more than a predetermined value.
- **Ventilation Function:** The ventilation function avoids the condensation of moisture inside the compost.

We improved the ventilation function of the waste management robot system in order to have better oxidization and fermentation. The initial model of waste management robots (left) and the improved model (right) are shown in Figure 5. In the improved version we created many holes.

Control of Waste Management Robots

The control screen of waste management robot system is shown in Figure 6. There are 6 sets of temperature and moisture sensors which are controlled by the control system. The measured

data are stored and the feedback control is carried out by using the measured data.

EXPERIMENTS AND EVALUATION

We carried out experiments using four sets of waste management robots and one set of usual compost box (corrugated paper compost box). The measurement conditions are as follows.

- **Waste Management 1:** The mixer was operated for 1 minute every 12 hours.
- **Waste Management 2:** The mixer was operated for 1 minute every one hour.
- **Waste Management 3:** The mixer was operated for 1 minute every 12 hours. Also, when the internal temperature was less than 30 degrees, the heater function

Figure 4. Experimental environment of waste management robots

Figure 5. First model (left) of waste management robot and improved model (right)

- was activated in order to keep warm the internal temperature of the robot.
- **Waste Management 4:** The mixer was operated for 1 minute every one hour. Also, when the internal temperature was less than 30 degrees, the heater function was activated in order to keep warm the internal temperature of the robot.

- **Normal Compost Box:** The mixer was operated for 1 minute every 12 hours.

Experimental Conditions

In order to carry out the experiments, for 30 days we inserted 5 times per week the kitchen garbage into each waste management robot (compost box). Then, we measured the temperature and

Figure 6. Control screen of waste management robots

Figure 7. The change of internal temperature of waste management robots during the experiment

humidity inside each compost box. In Figure 7 are shown the temperatures of each waste management robot and the last one shows the outside temperature. The ▲ mark shows the time when the kitchen garbage was inserted into the compost box.

Evaluation Results

In Figure 8 is shown the temperature change in the waste management robots 1 and 2. We can see that when the fermentation starts, the tem-

perature inside the compost is increasing. The fermentation in the waste management robot 1 starts 24 hours after the kitchen garbage were inserted. However, in the waste management robot 2, it starts immediately after the kitchen garbage were inserted.

The change of internal temperature of the waste management robots 3 and 4 is shown in Figure 9. Because the heater function was activated to keep the temperature constant at 30 degree, both composts box have almost the

Figure 8. The change of internal temperature of waste management robots 1 and 2

Figure 9. The change of internal temperature of waste management robots 3 and 4

same temperature and the difference for both graphs is small.

The change of the temperature and humidity of the waste management robots 1 and 2 are shown in Figure 10. While, the change of the temperature and humidity of the waste management robots 3 and 4 are shown in Figure 11. In Figure 10, the humidity is increased proportionally with the increase of the fermentation. The humidity is over 80% before and after we inserted the kitchen garbage. However as shown in Figure 11, because of the heater activation,

the temperature is about 30 degrees, but the humidity is less than 80%.

In Figure 12, we show the compost of normal compost box and waste management robots. Even the fermented period is the same, it is clear that waste management robots perform better than normal compost box. Thus, the waste management robot system is a very good system for decreasing the environment pollution.

Figure 10. The change of internal temperature and humidity of waste management robots 1 and 2

Figure 11. The change of internal temperature and humid of waste management robots 3 and 4

CONCLUSION AND FUTURE WORK

In this work, we presented the design and implementation of a waste management robot system, which is a distributed system that combine the robot technology and compost technology for recycling of kitchen garbage discharged from humans. The proposed system process

effectively the kitchen garbage by combining information network functions, sensor technology and robot technology.

We evaluated the performance of the proposed system by some experiments. From the experiments we found that the churning (mixing) function is a very effective function and more than 80% of humidity was required in order to generate a compost. Furthermore,

Figure 12. Normally compost box and waste management robots

the heater function is necessary to control the temperature and humidity.

In the future, we would like to implement a moisture control device. Also, in order to build a better recycling environment, we would like to obtain the power supply from solar system or wind power generation.

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