

Development of a Social Assistive Robot for Elderly Care

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Abstract : This presentation presents an elderly care and assistive social robot development work. We named this robot JOS and he is restricted to table top operation. JOS is designed to have a maximum volume of 3600 cm³ with its base restricted to 250 mm and his mission is to provide companion, assist and help the elderly. In order for JOS to accomplish his mission, he will be equipped with perception, reaction and cognition capability. His appearance will be not human like but more towards cute and approachable type. JOS will also be designed to be neutral gender. However, the robot will still have eyes, eyelid and a mouth. For his eyes and eyelids, they will be built entirely with Robotis Dynamixel AX18 motor. To realize this complex task, JOS will be also be equipped with micro-phone array, vision camera and Intel i5 NUC computer and a powered by a 12 V lithium battery that will be self-charging. His face is constructed using 1 motor each for the eyelid, 2 motors for the eyeballs, 3 motors for the neck mechanism and 1 motor for the lips movement. The vision sensor will be house on JOS forehead and the microphone array will be somewhere below the mouth. For the vision system, Omron latest OKAO vision sensor is used. It is a compact and versatile sensor that is only 60mm by 40mm in size and operates with only 5V supply. In addition, OKAO vision sensor is capable of identifying the user and recognizing the expression of the user. With these functions, JOS is able to track and identify the user. If he cannot recognize the user, JOS will ask the user if he would want him to remember the user. If yes, JOS will store the user information together with the capture face image into a database. This will allow JOS to recognize the user the next time the user is with JOS. In addition, JOS is also able to interpret the mood of the user through the facial expression of the user. This will allow the robot to understand the user mood and behavior and react according. Machine learning will be later incorporated to learn the behavior of the user so as to understand the mood of the user and requirement better. For the speech system, Microsoft speech and grammar engine is used for the speech recognition. In order to use the speech engine, we need to build up a speech grammar database that captures the commonly used words by the elderly. This database is built from research journals and literature on elderly speech and also interviewing elderly what do they want to robot to assist them with. Using the result from the interview and research from journal, we are able to derive a set of common words the elderly frequently used to request for the help. It is from this set that we build up our grammar database. In situation where there is more than one person near JOS, he is able to identify the person who is talking to him through an in-house developed microphone array structure. In order to make the robot more interacting, we have also included the capability for the robot to express his emotion to the user through the facial expressions by changing the position and movement of the eyelids and mouth. All robot emotions will be in response to the user mood and request. Lastly, we are expecting to complete this phase of project and test it with elderly and also delirium patient by Feb 2015.

Keywords : social robot, vision, elderly care, machine learning

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