

ROBOT COMPANION FOR ADAPTIVE HOME ENVIRONMENT

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text.

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Dr. A.G.B.P. Jayasekara

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Abstract

Robot companions are being developed to assist humans in domestic environment. Sooner rather than later, robot buddies will be a piece of our typical family's day by day life attempting to help with local errands and dealing with us when required. Notwithstanding, before this turns into a reality, imperative issues should be tended to in the Human-Robot Interaction (HRI) field so as to accomplish social robots equipped for communicating with people also to which people associate with each other.

One of the greatest difficulties in this field is to endow robot associates with those social capacities expected to collaborate with a man amid a consistent period. These aptitudes can be upgraded by utilizing robot's own sensors or outer tactile frameworks introduced around the trial condition, so robots could know about the logical data. The fuse of these capacities hopes to enhance the association and the robot colleagues acknowledgment by people. Individuals have desires when initially experiencing a buddy robot, particularly in domestic environments, where the capacity to mingle and impart in a human-like manner and distinguishing the real necessity of the user by utilizing human like knowledge by recognizing user behavior without user to mention it, are crucial highlights to fuse keeping in mind the end goal to accomplish the coveted level of collaboration expected by people.

This Research Project was based on to achieve a robot companion which would identify the actual requirement of the user by using human like intelligence by identifying the user behavior without user to mention the requirement by himself and to have the ability to socialize and communicate with the user and with using these two major capabilities control the lighting level, temperature and humidity of the home which would aid the elderly people, differently abled people and also the normal family. This developed intelligent robot companion named HomeBot (HB) that has ability to control the ambient conditions of the smart home environment based on the detected user behavior for improved the user experience. In order to enhance the interaction ability the interaction between the user and the HB is integrated with a vocal interaction module.

After identifying the above mentioned current requirements which need to be addressed by an assistive home robot companion with the use of literature reviewing and brain storming sessions, HB was designed and developed which is capable of adapting the ambient conditions in accordance to the user behavior. The user behavior identification is facilitated by an artificial neural network that has been trained to detect the different postures of humans such as sitting and standing. Based on the identified user behavior, the robot controls the smart devices available in the home to realize the adaptation of ambient conditions. The smart devices and companion robot connect over a wireless network. Furthermore, voice interaction capabilities have also been incorporated to the robot companion to facilitate voice interaction based controlling of ambient conditions. A prototype of the system has been developed and the capabilities of the system have been validated experimentally.

A robot companion capable of providing assistance and companionship to the users of all kinds such as to normal family, elderly people or to differently abled people will be the new technology to be experienced by the people in near future. Hence a robot companion who has the capability to provide both assistance, companionship and to provide smart home appliance controlling to provide most suitable ambient condition in the home in accordance to the user behavior was the aim to be achieved by this Research Project. Identification more postures and gestures by training the developed neural network and there by providing more user experience are proposed as further improvements.

Keywords — Robot companions, Behavioral Pattern Recognition, Smart Homes

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