INTELLIGENT FALL DETECTION AND NOTIFICATION SYSTEM FOR AN IOT BASED SMART HOME ENVIRONMENT

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Degree of Master of Science by Research

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DECLARATION

I declare that this is my own work and this dissertation 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 the acknowledgement is made in the text.

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Signature: Date:

The above candidate has carried out research for the MSc thesis under my supervision.

Signature of the Supervisor(s): Date:

Prof.A.G.B.P.Jayasekara

Dr.G.I.U.S.Perera

Abstract

Throughout the history of technology, various mechanisms to support the elderly and the disabled have been introduced as a remedy for the inadequacy of caregivers to provide them with the required assistance in leading an independent and secure living. Among all those mechanisms, smart homes and social robotics appear to play a significant and effective role in assuring a comfortable and safe environment for the elderly and the disabled who prefer to live independently without causing an extra burden on their families.

However, most of the existing assistive systems lack the required levels of accuracy and timeliness which causes increased probability of resulting them in higher risk of damage after encountering an emergency while staying alone at their homes. Therefore, in order to ensure the availability of timely assistance and support, the introduction and development of effective emergency detection and notification systems is an essential necessity in the present world.

This research work introduces a Smart Home System consisting of three subsystems integrated together over an IoT Cloud with the main objective of improving the quality of life of the elderly and the disabled by providing them with ample support in performing their activities of daily living without compromising safety and independence.

The proposed system presents a novel vision based method of detecting falls from standing or walking positions that is also capable of distinguishing the identified falls among three types so that the medical attention could be easily focused. A special subsystem is also introduced for the identification of sitting postures and detection of falls from wheelchairs for the people with mobility impairments.The fall detection and posture identification are carried out with a social robot called MIRob which receives visual input through a Microsoft Kinect Sensor. A novel emergency notification system is also presented where, the notification is performed by implementing a Q-Learning algorithm using a Reinforcement Learning agent via an Android application. Through experimental studies the overall proposed system has promised to guarantee acceptable levels of accuracy and timeliness in providing assistance to the elderly and the disabled.

***Keywords*- Fall Detection, Posture Identification, Emergency Notification, Wheelchair Users, Social Robotics, Smart Homes, Independent Living**

DEDICATION

To my family,

for always loving and supporting me...

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