Fall Alarm and Inactivity Detection System Design and Implementation on Raspberry Pi

Qifan Dong*, Yang Yang*, Wang Hongjun*, Xu Jian-Hua**

* *School of Information Science and Engineering, Shandong University, Jinan, China, 250100*

** *The 41st Research Institute of China Electronics Technology Group Corporation, Qingdao, 266555, China*

yyang@sdu.edu.cn

***Abstract*—In this paper, a fall alarm and abnormal inactivity detection system is implemented on Raspberry Pi for security surveillance of empty-nesters in real time environment. We propose a novel method for fall alarm with a small amount of computing and we also present an inactivity detection method which we named "inactivity history" method to improve the accuracy of detection and it is a kind of adaptive method so it works well in even different environments. For fall alarm, we divide the image into many rectangular areas and according to the area of body in each rectangle we will judge whether the elderly fall or not. For inactivity detection, we count the average inactivity time of people in different rectangles to set up the inactivity history map to judge whether people are in abnormal inactivity accurately. There are also E-mail and SMS warning functionalities, providing a very good safeguard for the elderly. Meanwhile, terminal device have advantages of small size and low power consumption, which will lead to wide applications. The system satisfies real-time and reliable requirements. Extensive experiments carried out demonstrate the effectiveness of our system.**

***Keyword*—Empty-nester, Raspberry Pi, Fall Alarm, Inactivity Detection, Computer Vision, Video Surveillance**

Qi-Fan Dong (M'15) was born in Shandong province, China in 1990.This author become a Member (M) of IEEE in 2015.He received his B.S. degree in Integrated Circuit Design and Integrated Systems from School of Information Science and Engineering, Shandong University, China in 2013.In September 2013, he joined the Integrated Circuit Engineering, School of Information Science and Engineering, Shandong University. His current research interest is Digital Image Processing.

Yang Yang received the BSc degrees of Electronic and Information Engineering and the PhD of Signal and Information, in School of Information Science and Engineering from Shandong University, China, in 2004 and 2009, respectively. He has been with School of Information Science and Engineering, Shandong University since 2009. He was a research assistant in Polytechnic University, Hong Kong from Aug.2006 to Jan.2007 and from Dec.2007 to Aug.2008, and a research associate in Polytechnic University, Hong Kong from July 2010 to Aug.2010 , and a postdoc of Control Science and Engineering at Shandong University from Sept.2009 to Sept.2011, a postdoc of Biomedical Engineering at Imperial College London from Oct.2012 to Oct.2013.

Wang Hong-Jun is a professor at the School of Information Science and Engineering, Shandong University. His research interest covers medical image processing and analysis, image guided radiation therapy.

Xu Jian-Hua was a researcher in in 41st Institute of China Electronics Technology Group Corporation engaging in electronic measurement technology and development of measurement instrument. His present research interests include signal reception and signal analysis techniques.