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Activity Recognition for Indoor Fall Detection in 360-degree videos using Deep Learning techniques

Dhiraj[1], Raunak Manekar1, Sumeet Saurav[1], Somsukla Maiti[1], Sanjay Singh[1], Santanu Chaudhury[1]

Neeraj[2], Ravi Kumar[2], and Kamal Chaudhary[2]
[1] CSIR-CEERI, Pilani, INDIA
[2] Samsung Research India, New Delhi, INDIA
dhiraj@ceeri.res.in

Abstract. Human activity recognition(HAR) targets the methodologies to recognize the different actions from a sequence of observations. Vision-based activity recognition is among the most popular unobtrusive technique for activity recognition. Caring for elderly, living alone from remotely is one of the biggest challenges of modern human society and is an area of active research. The usage of smart homes with increasing number of cameras in our daily environment provides the platform to use that technology for activity recognition also. The usage of omnidirectional cameras for fall detection activity minimizes the requirement of multiple cameras for fall detection in the living scenario. Consequently, we propose a vision-based solution using convolutional neural networks and long short-term memory networks using 360-degree videos for human fall detection. We have constructed an omnidirectional video dataset by recording a set of activities performed by different people as no such 360-degree video dataset is available for human activity recognition in public domain. Our results prove the suitability of 3DCNN and LSTM techniques for fall detection activity for even omnidirectional videos.

Keywords: Activity Recognition, Omnidirectional Video, 3D Convolutional networks, Long short-term memory networks. Fall Activity, Daily Activity.

1 Introduction

Human Fall is one of the major health risks in modern life style particularly for old people who are living alone, which may cause death in some situations if proper medication is not followed after the event. Along with this, it may result in post-fall syndrome such as permanent immobilization, depression, etc. which further restrict the movement. As reported, approximately 40 % of deaths due to injury are primarily caused due to fall only. So, early detection of fall is an important step so as to timely support the elderly by warning or informing their family members. The fall accidents cannot be completely prevented but fall detection system can save lives if it can identify a fall event and an alert has been generated instantaneously.

In this paper, we focus on vision-based approaches for fall detection. The cameras have now become omnipresent as they provide very rich information about persons