cs2310 Final Project: SIS Fall Detection System

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1 Introduction

System detecting falls have become a research focus in recent years because many health care reasearch institution have pointed about that falls are the leading factors causing injury and death for older people.

There have been a lot of systems developed to detect the fall of the old people. But most of them require the users to wear motion sensor to enable the tracking of the user's movement. Other systems which don't require the user to wear the motion sensor are very costly and difficult to be set up.

In this report an affordable but reliable way to develop fall detection SIS systems using the Microsoft Kinect sensor is introduced. The report is organized in this way:

1. An overview of SIS system and Kinect is introduced.
2. The details of the implementation is discussed.
3. The conclusion of the Kinect fall detection system with SIS is drawed, along with the future work.

2 The overview of SIS system and Kinect

A slow intelligence system is a system that

1. solves problems by trying different solutions
2. is context-aware to adapt to different situations and to propagate knowledge
3. may not perform well in the short run but continuously learns to improve its performance over time.

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In this project, we integerate the fall detection system as a component of the SIS system, and make use of the SIS system's ability to connect to the other components to notify the doctor of the patients' fall to take emergency measures to save the patients.

The Kinect contains three types of sensors: a standard camera, an IR camera, and a microphone array. The IR camera detects points projected by a laser and automatically converts them into a depth map. The cameras are calibrated so that the depth map pixels correspond to the pixels in the standard camera images.

The Kinect SDK is a free software package which provides a variety of useful tools. The software will automatically detect the 3D location of 21 joints for two people. No markers are required for the software to detect join locations. In addition to joint locations, the Kinect SDK also detects the location of the floor plane.

3 The SIS fall detection system and its implementation

To run the SIS fall detection system, follow the instructions below:

3.1 Set up SIS components

First, we need to set up the SIS components as Figure1 shows so that our implementation of the Kinect fall detection system can be run successfully as a part of the SIS system and send messages to the other components of the SIS system.

3.2 Set up Kinect sensor and let Kinect track your skeleton

Next we need to set up the Kinect sensor as Figure2 shows to detect the skeleton of the patient's body so that the position information of each joint can be captured for processing.

3.3 Patient's fall detected

After we've successfully set up both the SIS environment and the Kinect Sensor, the SIS fall detection system runs successfully. So once a patient fell, the local SIS environment will generate a corresponding alert to warn the related stuff the emergency as shown in Figure 3.

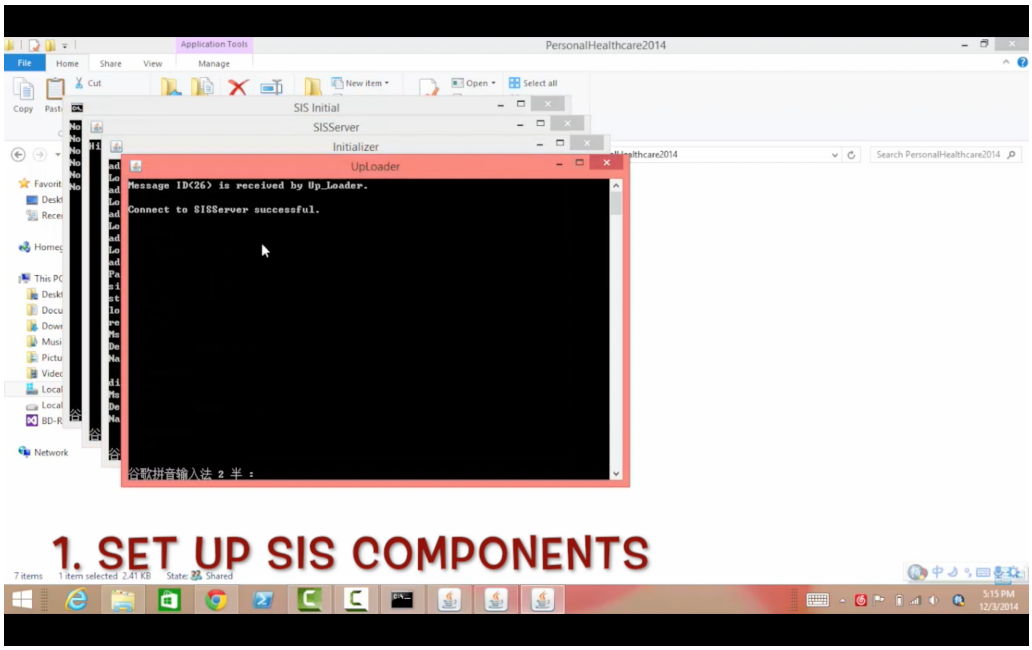

Figure 1: Set up SIS components

3.4 Patient's motionless detected

Also, when a patient doesn't move for a certain period of time, the SIS fall detection system will also generate a message to alert that the patient is motionless for a long time and ask the stuff to take actions to save them as shown in Figure 4.

3.5 The uploader of the SIS system will post a twitter to the doctor's account

After an emergency happens, the uploader of the SIS system will send a twitter posting the events happening as shown in figure 5, 6, 7, 8, including:

1. The time when the event is happening
2. The location where the event is happening
3. the type of the emergency, whether the patient fell or is motionless for a long time.

Doctors and other stuff can make use of the above information to take the corresponding actions.

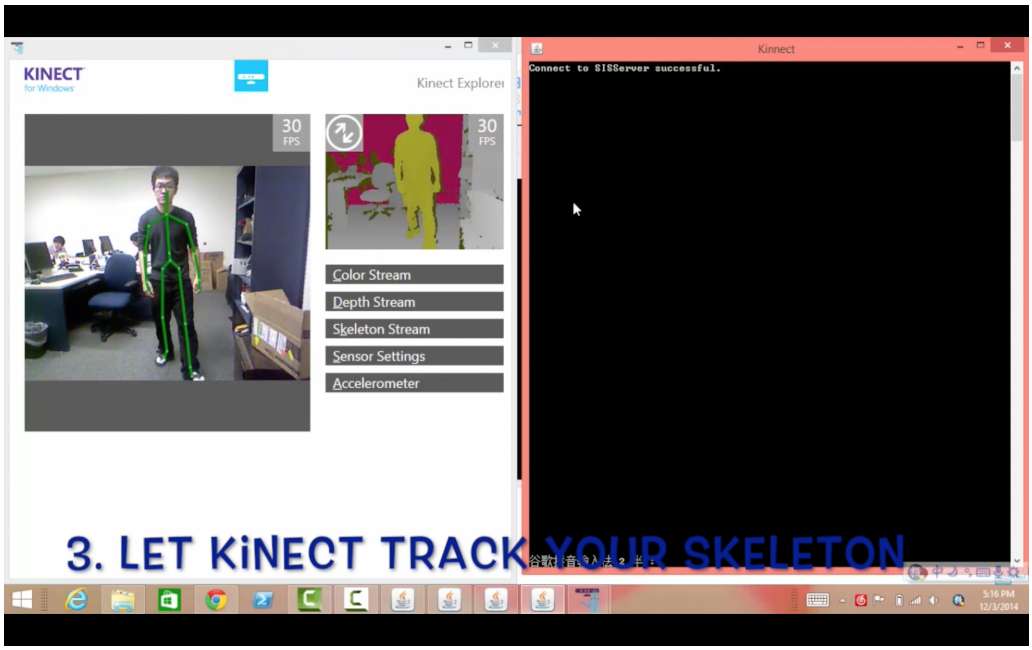

Figure 2: Set up Kinect sensor and let Kinect track your skeleton

4 Conclusion and future work

In conclusion, the SIS fall detection system make use of the SIS system and integrate the Kinect sensor into it as a separate component. Currently, we just combine the Kinect sensor with the SIS system, while in the future, we may consider use the SIS to refine our result of detecting the dangerous movement, excluding the false fall detection. In addition, we may consider adding other types of dangerous movement to enhance the detection of other types of emergency events.

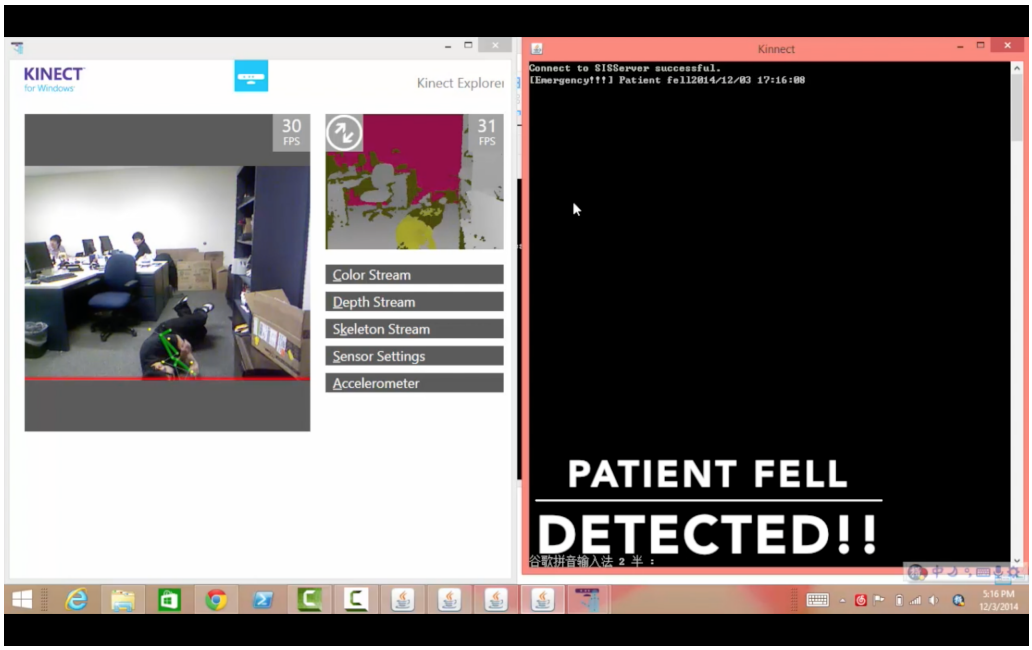

Figure 3: Patient's fall detected

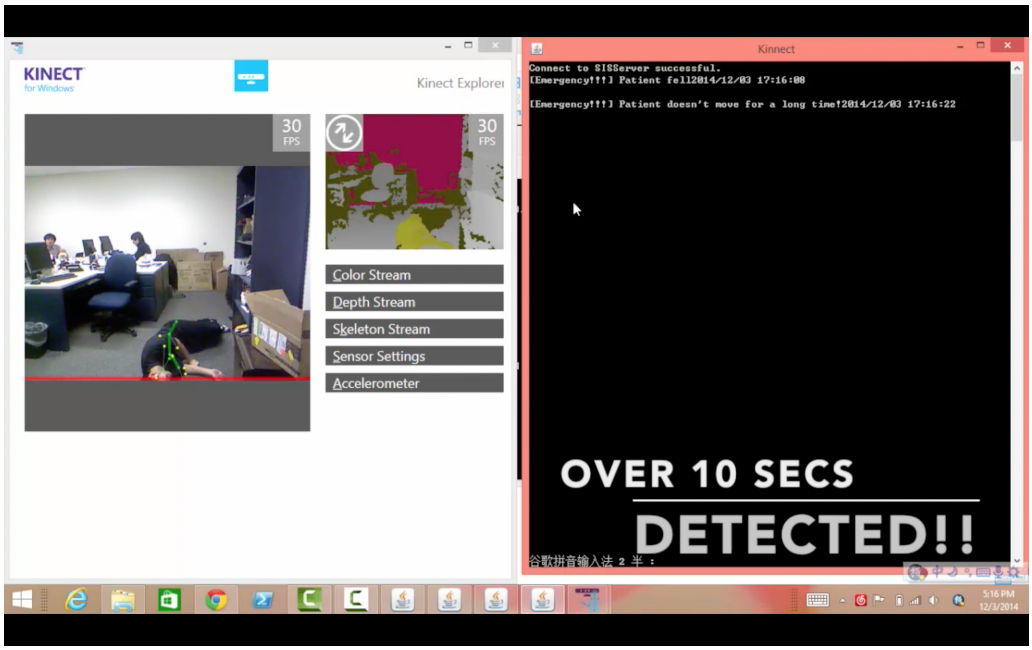

Figure 4: Patient's motionless detected

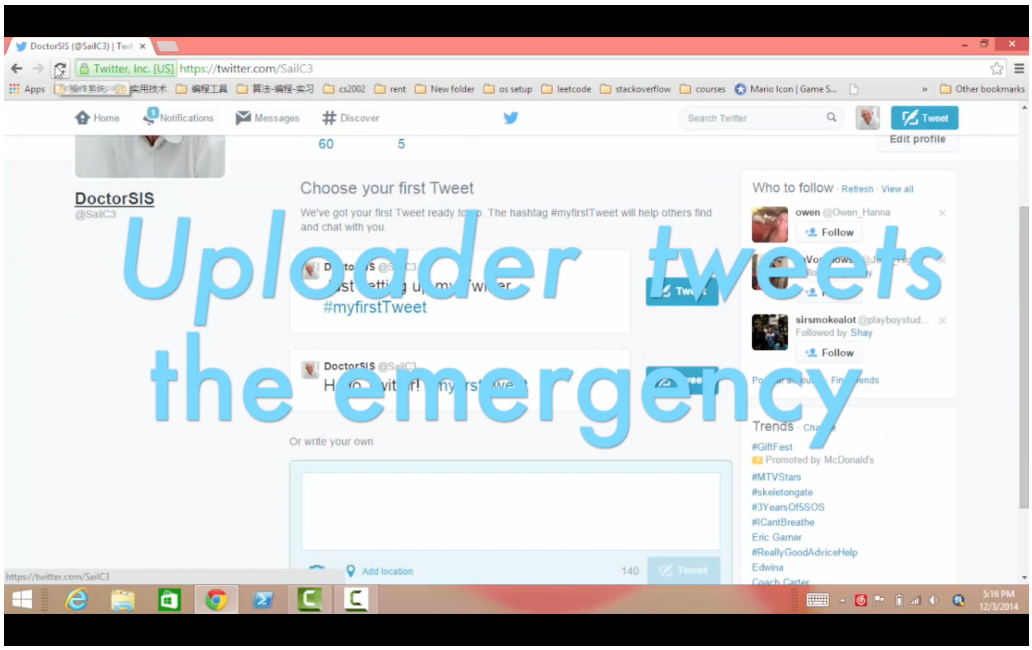

Figure 5: SIS tweets the emergency posting the information

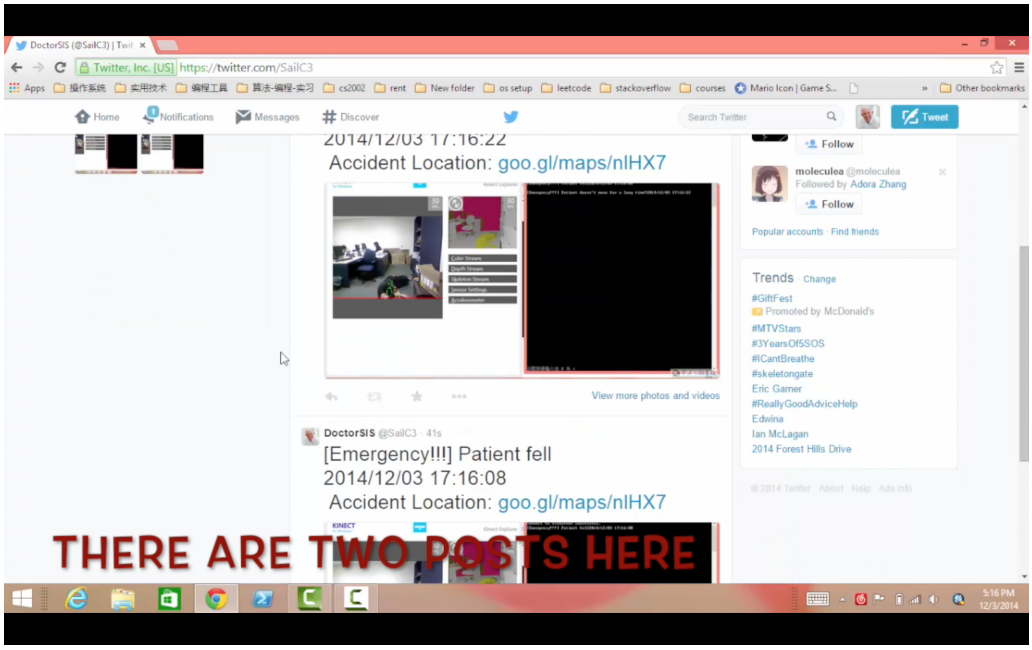

Figure 6: SIS tweets the emergency posting the information

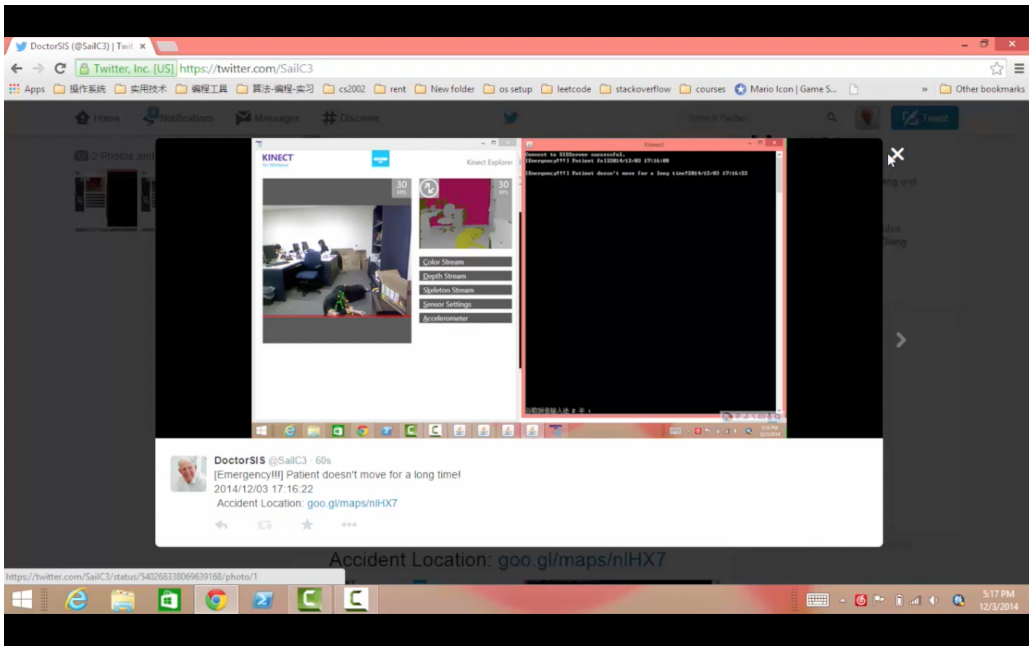

Figure 7: SIS tweets the emergency posting the information

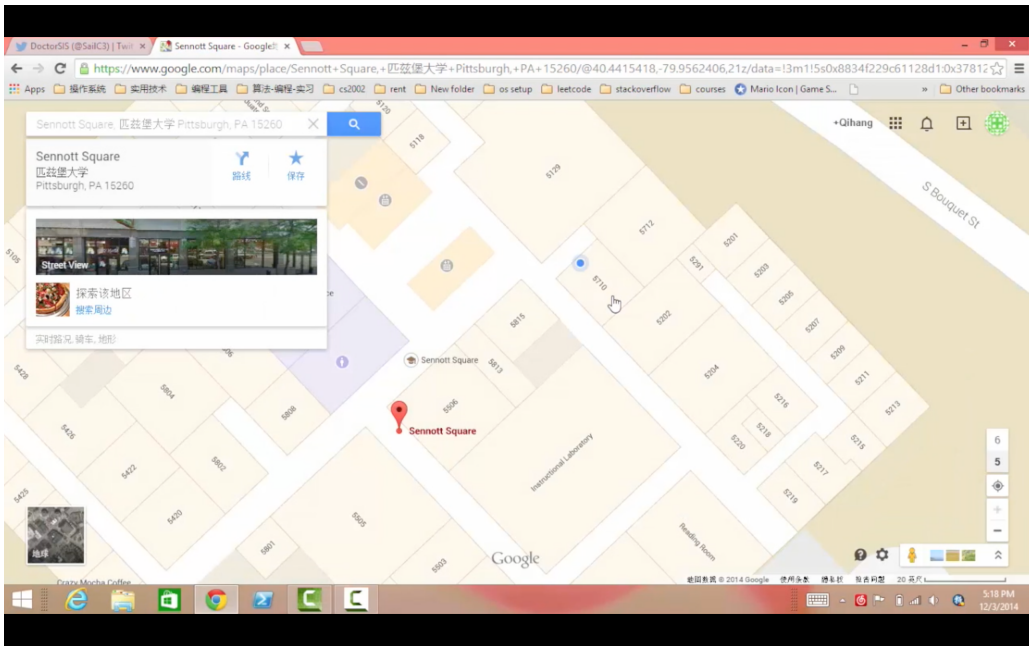

Figure 8: SIS tweets the emergency posting the information