MS1 K1 with Speed estimation

Z i h a o Z h a o

1.System View

(1) SIS server:

The SIS server mainly deal with messages from various components. General messages include Create , Kill Activate, which enable SIS server to create, kill and activate a component. Also, SIS server deliver the messages to corresponding component to process the messages.

(2) GUI:

Display graphical information from system. For example, GUI displays human movement from Kinect infrared device. It shows the warning messages like "High Speed warning" from system.

(3) Kinect Sensor device:

The input sensor of the system.

(4) Kinect Component:

Read the data input from InputProcessor. Analyze Human movement and send message to SIS server about the fall detection and speed estimation. Human movement can be describe as movement of several parts of human body(hand, head, shoulder,foot) which are recognized by the device and convert into (x,y,z) tuple. When initialized, it starts fall detection and speed estimation algorithm. When the patient moves over certain speed, it send warning message to SIS server.

(5) Input Processor:

It is the predesigned component which takes in data stream from Kinect and transform them into the specific form for SIS system.
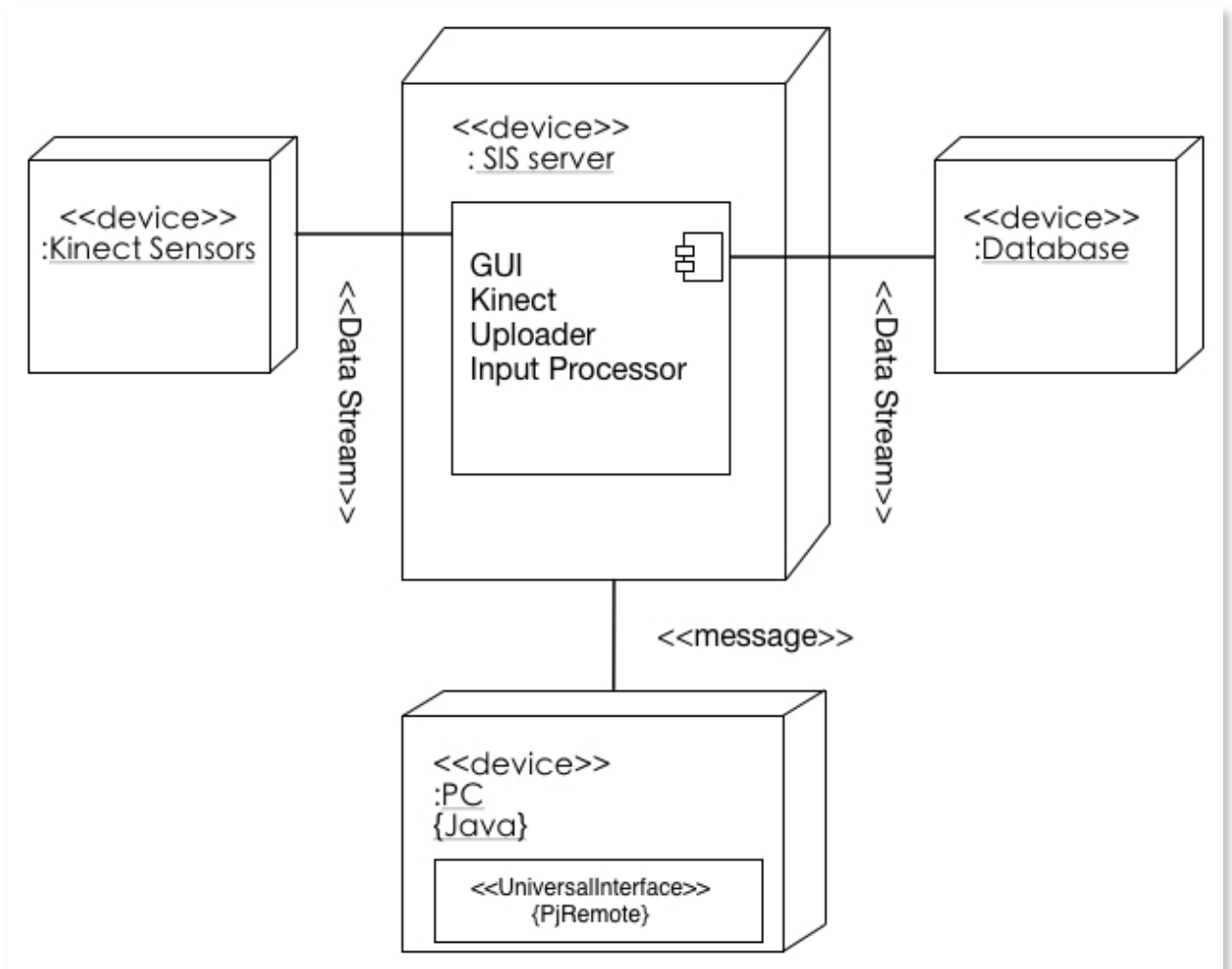
(6) Uploader:

Also the predesigned component which upload the data stream to the Internet and Database, so that the patient information is shared.

(7) Universal Interface:

The Interface is mainly for the testing.

The UML deployment diagram as follows:

2. Messages

(1) CREATE GUI

MsgID:20   Description: Create GUI Component

Variables:

    Passcode: ****
    SecurityLevel: 3
    Name: GUI (Name of created Component)
    SourceCode: Gui.jar (Source code file name of created Component)
    InputMsgID 1: 1016 (KinectToGUI)
    InputMsgID 2: 2001(Fall Detect)
    InputMsgID 3: 2002(Speed Warning)
    OutputMsgID 1: 20 (Create Uploader/Inputloader Component)
    OutputMsgID 2: 21 (Create Kinect Compoment)
    OutputMsgID 3: 22 (Kill Component)
    OutputMsgID 4: 1014 (GUIToKinect)
    Component Description: GUI displays the vital signals and manage SIS

(2) CREATE INPUTPROCESSOR COMPONENT

MsgID:20   Description: Create InputProcessor Component

Variables:

Passcode: ****

SecurityLevel: 3

Name: InputProcessor (Name of created Component)

SourceCode: InputProcessor.jar (Source code file name of created Component)

    InputMsgID 1: 30 (Kinect Sensor Data Input)
    OutputMsgID 1: 36 (Kinect Data Reading)
    Component Description: InputProcessor parses the data and extracts vital signals.

(3) CREATE UPLOADER COMPONENT

MsgID:20   Description: Create Uploader Component

Variables:

    Passcode: ****
    SecurityLevel: 3
    Name: Uploader (Name of created Component)
    SourceCode: Uploader.jar (Source code file name of created Component)
    InputMsgID 1: 2001(Fall Detect)
    InputMsgID 2: 2002(Speed Warning)
    OutputMsgID 1: 37 (General Health Readings)
    Component Description: Uploader uploads patients medical condition to remote
    database

(4) CREATE KINECT COMPONENT

MsgID:21   Description: Create Kinect Component

Variables:

    Passcode: ****
    SecurityLevel: 3

Name: Kinect Component (Name of created Component)
SourceCode: Kinect.jar (Source code file name of created Component)
InputMsgID 1: 36 (Kinect Data Reading)
OutputMsgID 1: 2001 (Fall Detect)
OutputMsgID 2: 2002 (Speed Warning)
Component Description: Kinect component is the processor of Kinect Data Input. By implementing Speed estimation and fall detection algorithm, this component discovers whether the patient is fall or prevent fall by sending speed warning message to GUI.
KnowledgeBase: Kinect.owl

3. Scenario

For the initialization, the UniversalInterface sends Msg 20 to SIS server to activate GUI, InputProcessor and Uploader, it also send Msg 21 to SIS server to activate Kinect Sensor and Kinect Component.

After initialization, GUI communicates with user and send Msg 45 to create user profile, including UserName, Age, Sex, Weight, Height, these information will be received by Uploader and Kinect component.

Then the Kinect Sensor sends Msg 30 to InputProcessor, where the raw Kinect data is parsed, and InputProcessor sends the Msg 36 to Kinect Component for the Kinect component can read the data stream.

If Kinect component detects patient is on floor, it sends Msg 2001 to GUI and Uploader about the patient's status. GUI is responsible to display fall detection message on screen and Uploader send the patient' status to online healthcare database. For speed estimation, Kinect component send Msg 2002 to GUI and Uploader, too. After receiving the messages, these two component did the same thing as above.

4. Other stuff

For future thoughts, we can improve on speed estimation, develop some pattern recognition algorithm to prevent fall.

REFERENCE:

[1] Fall detection system using Kinect's infrared sensor *Georgios Mastorakis Dimitrios Makris*

[2] Fall Detection in indoor environment with Kinect sensor *Vitoantonio Bevilacqua, Nicola Nuzzolese, Donato Barone*