Steve Faurie

Software Engineering Project Final Report

USES:

Using the SIS testbed I have created a system that monitors patient breathing and blood oxygen levels. A low breathing rate can be caused by several different conditions and can lead to low oxygen levels in the blood. This monitoring system reads in SPO2 readings and breathing rates to help monitor patients. The monitor provides real time output of the readings as well as saving them as JSON objects in a text file. JSON is a very convenient format to save the information in because it is easily parsed by any modern programming language and is also easily incorporated into websites.

Saving the data is useful for diagnosing a patient who may have breathing issues while sleeping as well. Sleep apnea is a common ailment that can prevent patients from getting adequate rest during the course of an evening. With this system we could provide the patient with two simple monitors to track breath rate and SPO2 levels. A doctor could evaluate the output remotely and at a more convenient time. This would allow the patient to avoid an expensive overnight stay in a sleep laboratory, or to see if a visit to one is warranted.

I have also included to simulators for simulating breathing rates and SPO2 levels. The simulators allow someone to enter different breathing rates and SPO2 levels to see how the system responds.

RUNNING THE SYSTEM:

Batch files for running the system are located in the SISv5\Scripts folder. First run the runserver.bat file. Then run runmonitor.bat, runBreathing.bat, runSPO2.bat. You can now enter simulated readings into the SPO2 and Breath rate simulators. To see the JSON output open sp02readings.txt and breathReadings.txt. A video demonstrating the use of the simulators is available here:

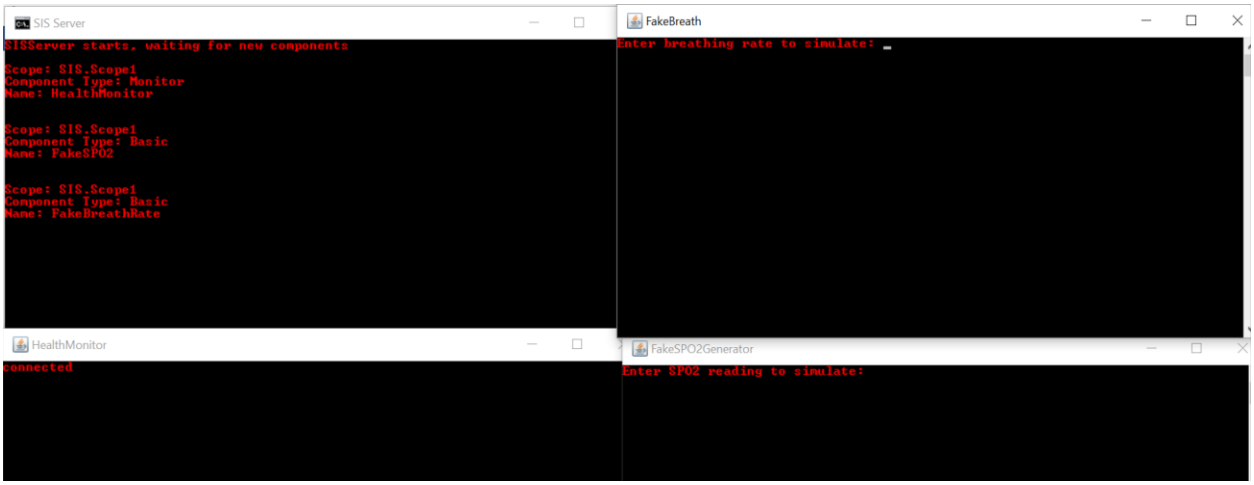
https://drive.google.com/file/d/0B5urXvC-5Ug2S2Rja3FSMzJFWm8/view?usp=sharing

If you want to see the source code you can click on the following link:

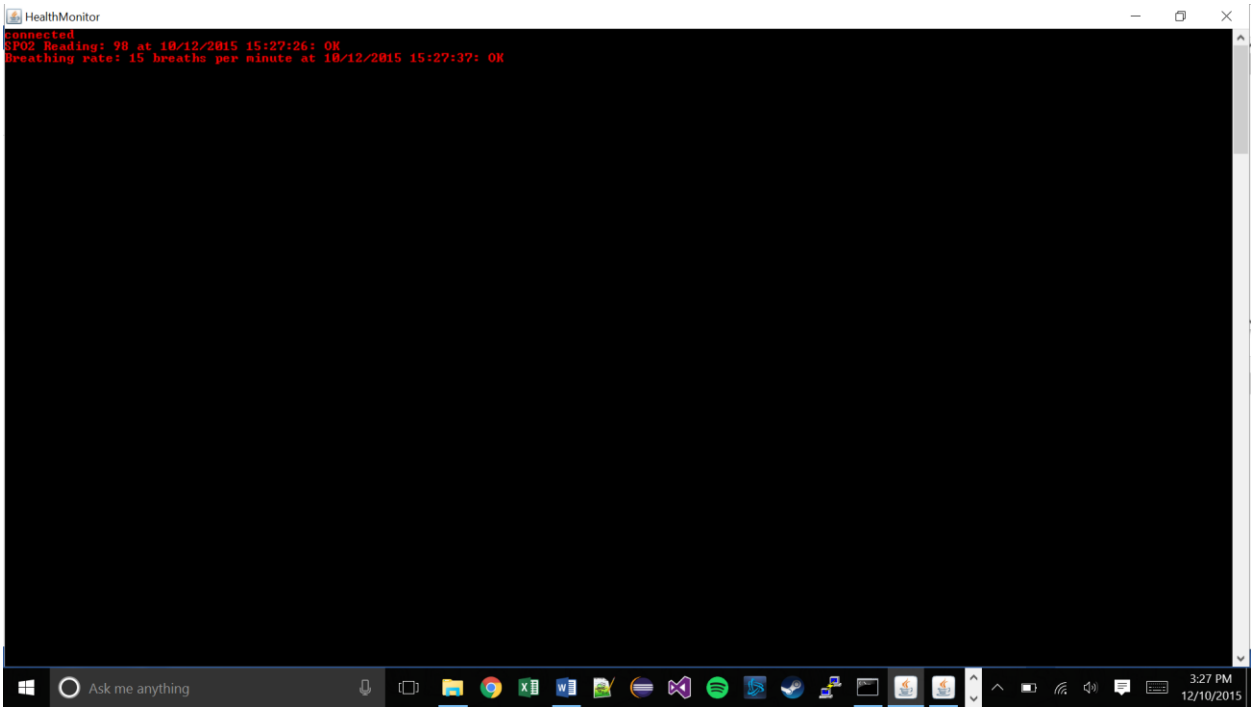
https://drive.google.com/file/d/0B5urXvC-5Ug2TEdWMF9jTU83bVU/view?usp=sharing

DEMONSTRATION:

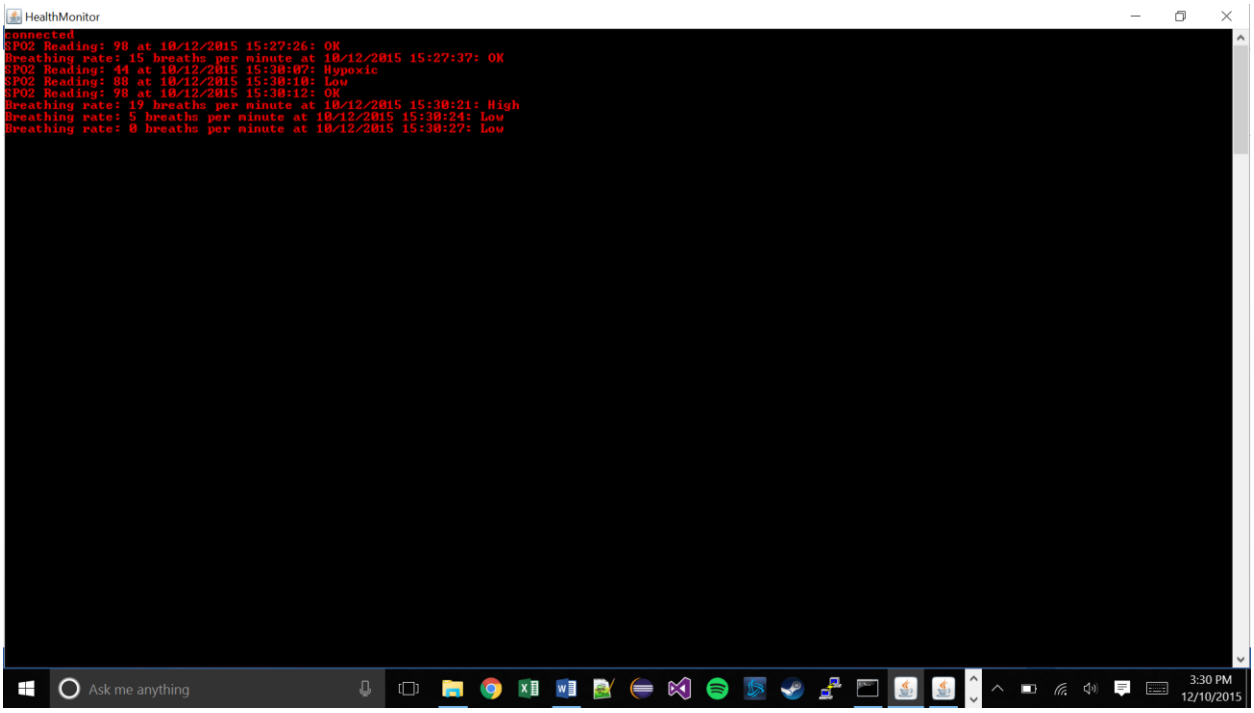
First start the SIS server and run all the batch files as described above. The following image shows the four command lines needed to run and observe the system.



After entering a reading in the Breath Simulator and SPO2 Simulator the Health monitor will display the following:



After entering several more you can see the following warnings and message acknowledgments:



The files with JSON will contain the data formatted as follows:

{"Date": "10/12/2015 15:27:37", "BreathPerMinute": "15"}

{"Date": "10/12/2015 15:30:21", "BreathPerMinute": "19"}

{"Date": "10/12/2015 15:30:24", "BreathPerMinute": "5"}

{"Date": "10/12/2015 15:30:27", "BreathPerMinute": "0"}

And:

{"Date": "10/12/2015 15:27:26", "SPO2": "98"}

{"Date": "10/12/2015 15:30:07", "SPO2": "44"}

{"Date": "10/12/2015 15:30:10", "SPO2": "88"}

{"Date": "10/12/2015 15:30:12", "SPO2": "98"}

CONCLUSIONS:

The SIS testbed provides a good foundation for implementing patient monitoring systems. By incorporating sensors into the system we would be able to easily and inexpensively monitor patients anywhere we have access to a PC and the required sensors. The SPO2 and breath rate monitor described above would be ideal for diagnosing patients that might be suspected of having sleep apnea while avoiding an expensive evening in a sleep monitoring facility. Doctors would only need to provide the patient with two relatively simple monitors and a computer program or PC running the program.

The two included breath rate and SPO2 reading simulators allow us to enter readings and see the files that are saved for future review. The formatting of the files allows for the data to be easily incorporated into websites, other programs or NoSQL databases.