SIDS NIGHT EYE GUARDIAN

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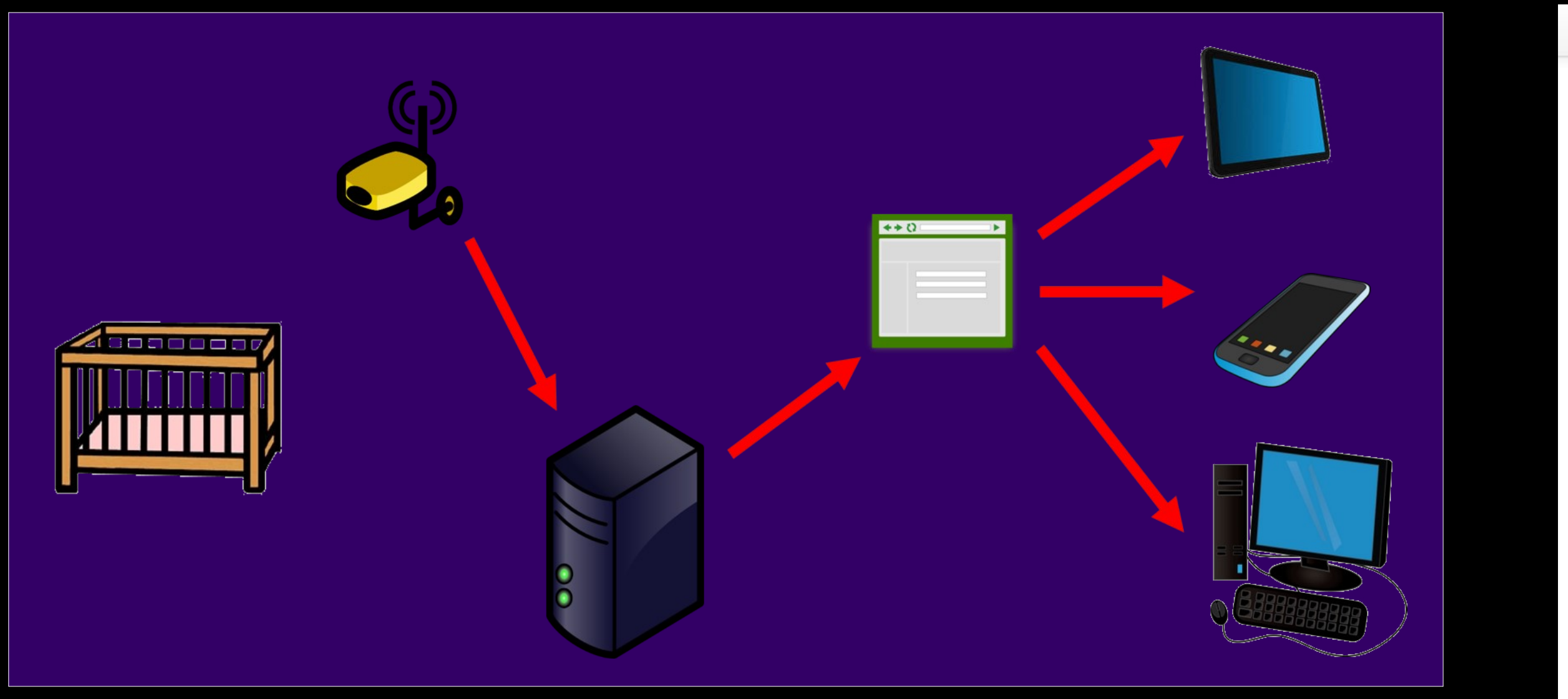
Senior Design Group May14-29

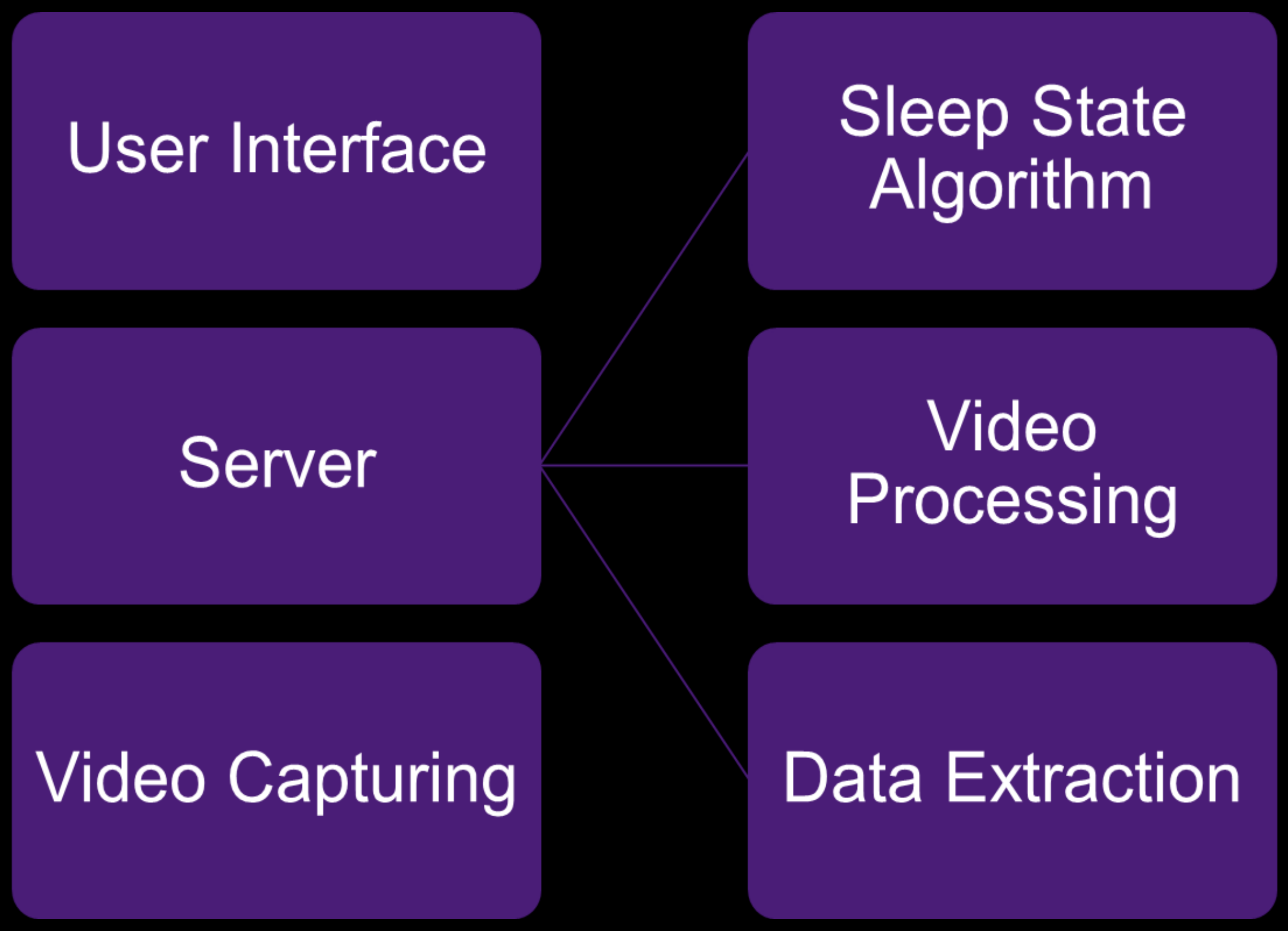


PROBLEM STATEMENT

Researchers that are analyzing Sudden Infant Death Syndrome (SIDS) need better tools for collecting and analyzing data from infant sleep studies.

Parents do not want intrusive tools in their child's sleep area and they want their child to be safe.

Researchers are looking for a way to gather the sleep data of infants without inconveniencing the parents or child.



User Interface

Sleep State Algorithm

Server

Video Processing

Video Capturing

Data Extraction

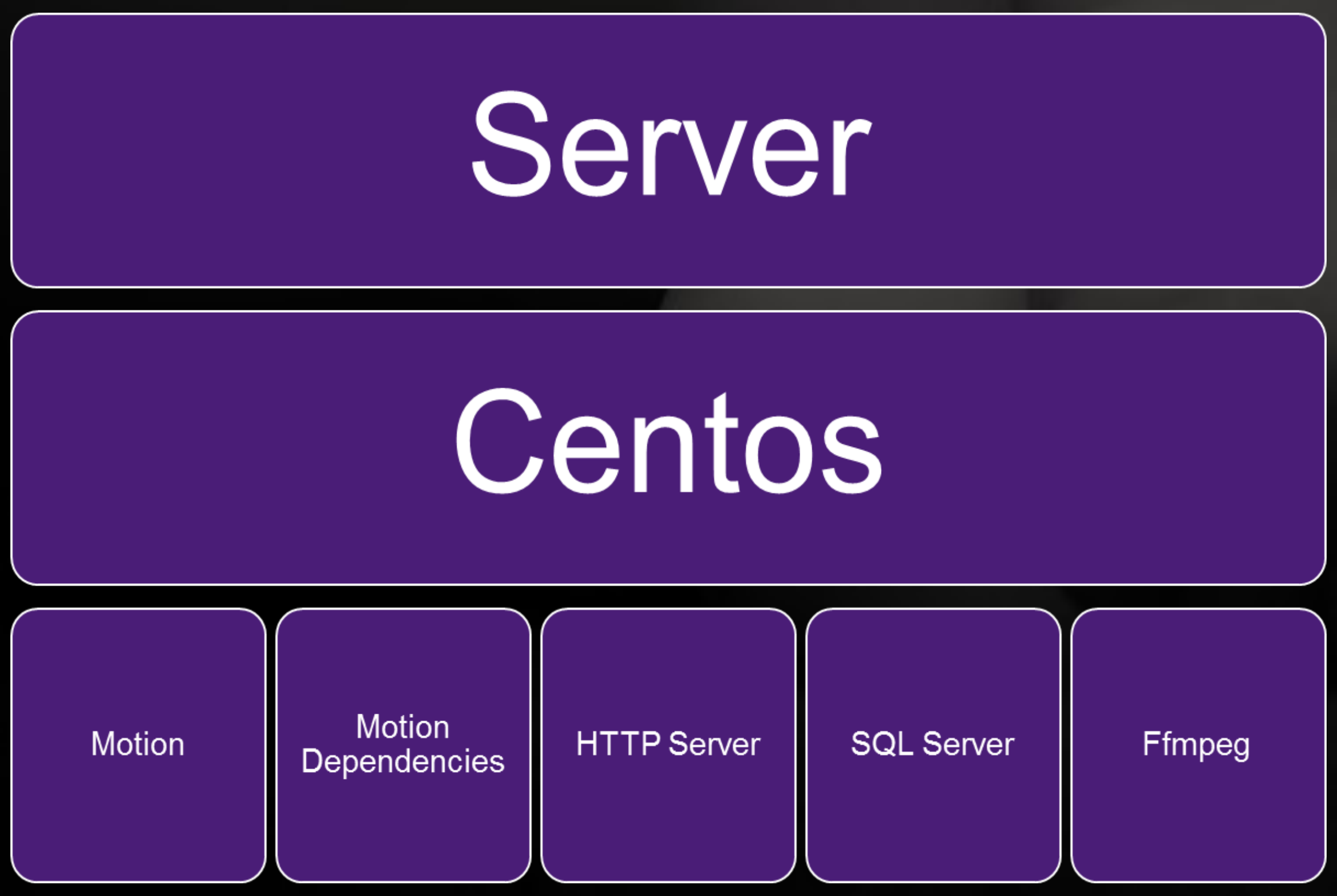
DESCRIPTION

We created a system built upon previous work from another senior design team to record a sleeping infant and use the video to determine the percent of time the infant is in each sleep state. There is charting of the detected activity level and breathing rates along with simulated heart rates that is displayed as a function of time.

This project consists of developing a web enabled tool by integrating a web camera with special software which graphically displays infant sleep data to researchers conducting Sudden Infant Death Syndrome (SIDS) Polysomnography (sleep studies). The project requires integration of existing open source components to detect activity and customizing a user interface to display the video, activity and heart rate graphs. This also included developing an algorithm to determine sleep states as a function of time based on the activity and simulated heart rate.

The team will make use of special software developed by MIT called, Eulerian Video Magnification (EVM), which is available for non-commercial research purposes. This software allowed for video enhancement, making motion much more evident.

The system hardware components consists of a motion detection camera, remote server, user's website and an optional wireless mobile device, to monitor infants as they sleep inside their cribs. The researchers will use the system and data to evaluate the infant's SWS/REM sleep states and cycles.



Server

Centos

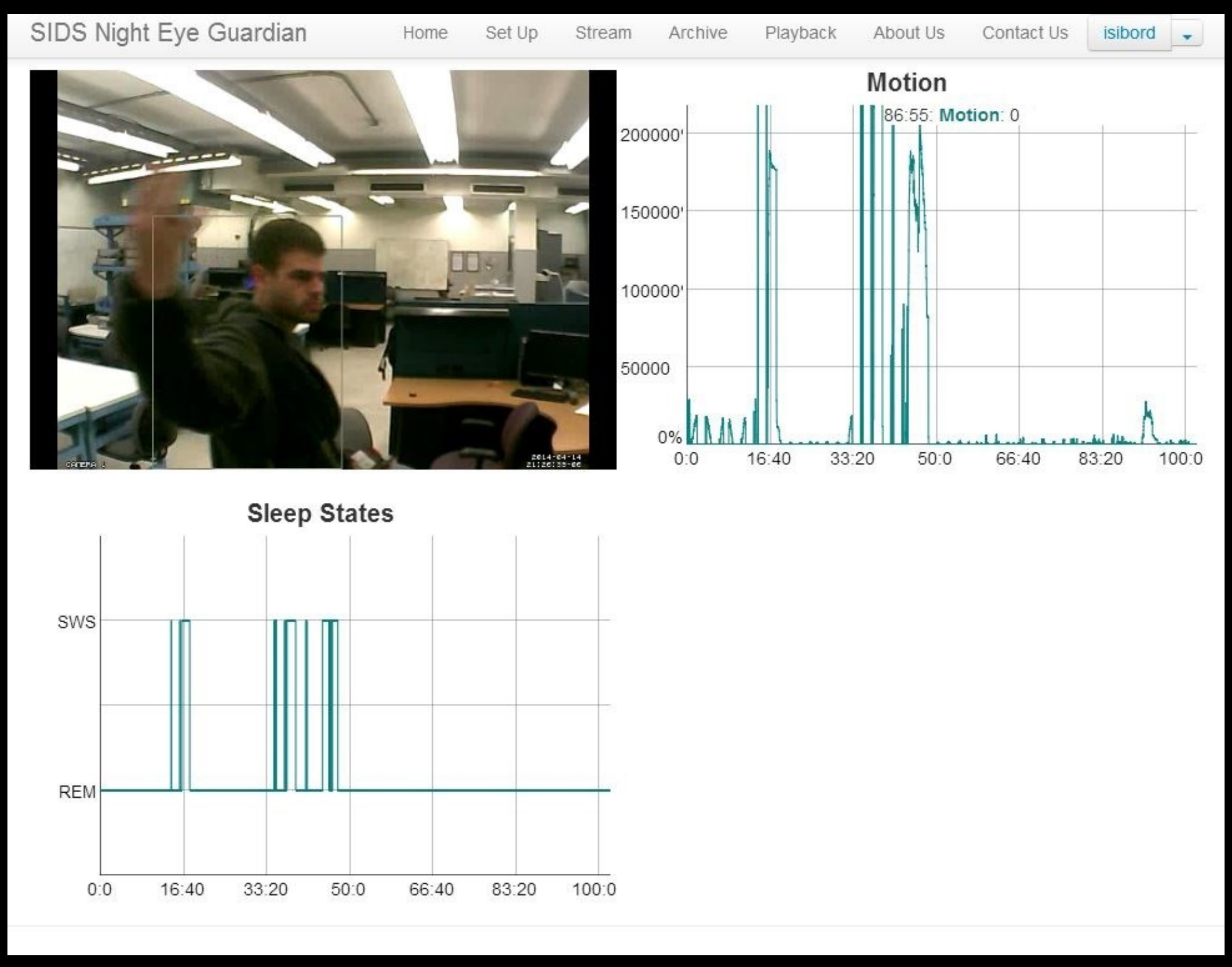
Motion

Motion Dependencies

HTTP Server

SQL Server

Ffmpeg



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SYSTEM DESIGN

User Interface

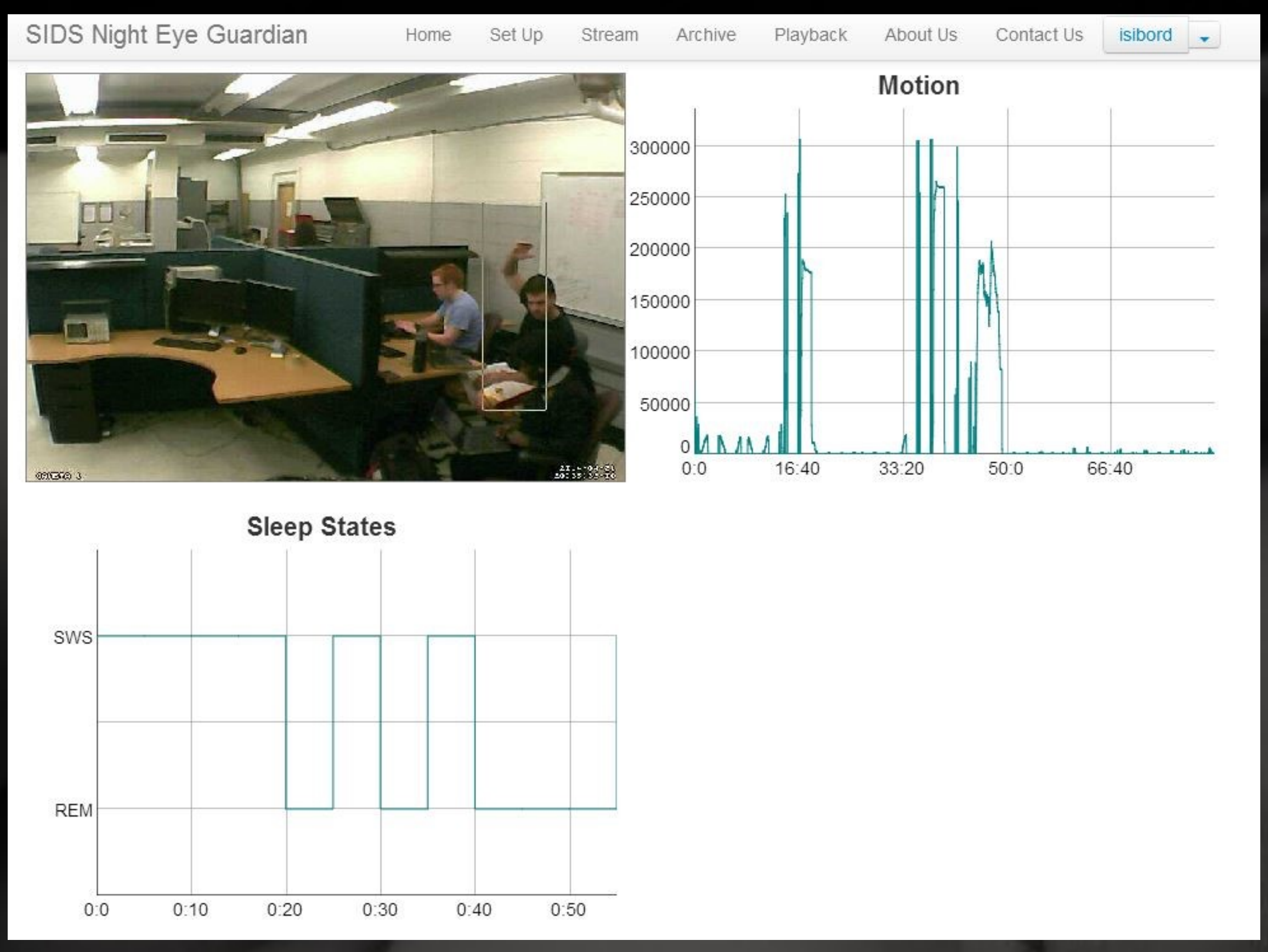
The user interface is a website that is designed to display the data in a useful way. This project requires an intuitive front end that allows users to view the necessary data for the specific user case. There are a few features that are very important to the project for instance, video display and related data.

Database

The database module stores data received from the cameras and then retrieves that data for processing and viewing. It will also store user information, such as, parent accounts, researcher accounts, etc.

Server

The server module controls all of the data processes run on the server. It receives video data from the cameras and stores it in the database. The video is then be run through the processing and data extraction algorithms. It also hosts the website to display video and data to the user.



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ISSUES

ZoneMinder -> Motion

Our original system was centered around an open-source software for managing motion cameras that a previous senior design group had set-up. Eventually, after many hardships and failed attempts at getting the software do what we expected of it to do, we redid our overall design to use another software called Motion instead. This software allowed us to extract motion data from the videos and provided us with a much more high-quality video stream to make our data more accurate.

Legacy Software

Since our project was based on a previous project, the implementations that were in place were where we intended to build our system on. After taking time to search for any documentation or even evidence of the previous group's work, we decided to start from scratch which set our schedule back considerably.

http://seniord.ece.iastate.edu/may1429/

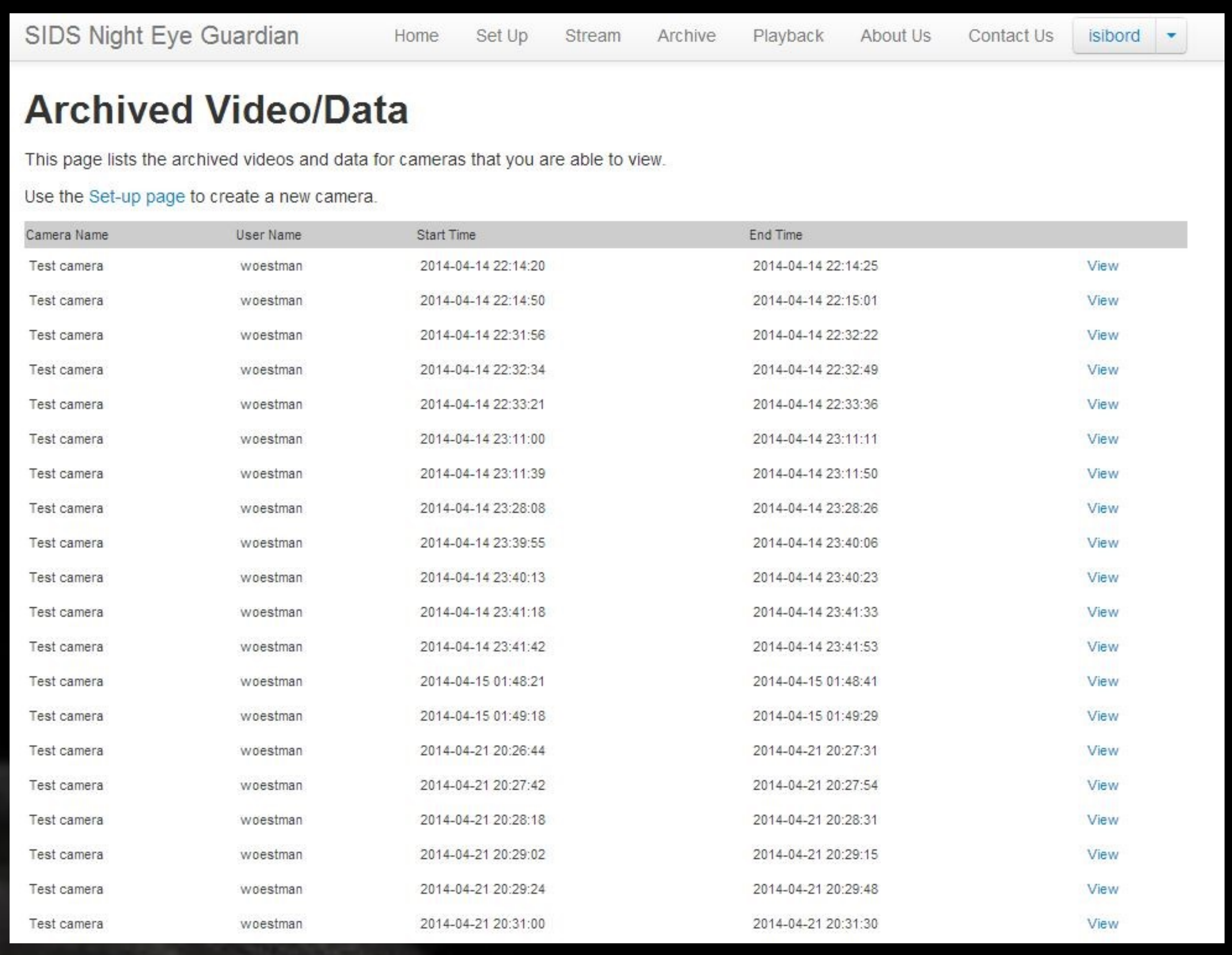
CLIENT

Adan Cervantes

S·I·D·S Know More.

REQUIREMENTS

- Manage remote video cameras.
- Provide a video stream to the server over a network.
- Import video feeds provided from IP Cameras to the server.
- Transform the raw video into a clearer image of motion, provided from MIT EVM software.
- Store motion captured information into a database.
- Provide a clean user interface for each use case.
- Display the edited video of motion for the users to watch.
- Display a graph of the motion sensing data synced with the edited video times.
- Display a graph of heart rate data being streamed (simulated for now).
- Determine Sleep States based on activity and heart rate.
- Display a graph and overall summary of mapped sleep states.



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Archived Video/Data

This page lists the archived videos and data for cameras that you are able to view.

Use the Set-up page to create a new camera.

Camera Name	User Name	Start Time	End Time	
Test camera	woestman	2014-04-14 22:14:20	2014-04-14 22:14:25	View
Test camera	woestman	2014-04-14 22:14:50	2014-04-14 22:15:01	View
Test camera	woestman	2014-04-14 22:31:56	2014-04-14 22:32:22	View
Test camera	woestman	2014-04-14 22:32:34	2014-04-14 22:32:49	View
Test camera	woestman	2014-04-14 22:33:21	2014-04-14 22:33:36	View
Test camera	woestman	2014-04-14 23:11:00	2014-04-14 23:11:11	View
Test camera	woestman	2014-04-14 23:11:39	2014-04-14 23:11:50	View
Test camera	woestman	2014-04-14 23:28:08	2014-04-14 23:28:26	View
Test camera	woestman	2014-04-14 23:39:55	2014-04-14 23:40:06	View
Test camera	woestman	2014-04-14 23:40:13	2014-04-14 23:40:23	View
Test camera	woestman	2014-04-14 23:41:18	2014-04-14 23:41:33	View
Test camera	woestman	2014-04-14 23:41:42	2014-04-14 23:41:53	View
Test camera	woestman	2014-04-15 01:48:21	2014-04-15 01:48:41	View
Test camera	woestman	2014-04-15 01:49:18	2014-04-15 01:49:29	View
Test camera	woestman	2014-04-21 20:26:44	2014-04-21 20:27:31	View
Test camera	woestman	2014-04-21 20:27:42	2014-04-21 20:27:54	View
Test camera	woestman	2014-04-21 20:28:18	2014-04-21 20:28:31	View
Test camera	woestman	2014-04-21 20:29:02	2014-04-21 20:29:15	View
Test camera	woestman	2014-04-21 20:29:24	2014-04-21 20:29:48	View
Test camera	woestman	2014-04-21 20:31:00	2014-04-21 20:31:30	View

MOTION

A software motion detector, is a free, open source CCTV software application developed for Linux.

It can monitor video signal from one or more cameras and is able to detect if a significant part of the picture has changed saving away video when it detects that motion is occurring (it can also do time lapse videos, etc.).

The program is written in C and is made for Linux. Motion is a command line based tool whose output can be either jpeg, avi files or mpeg video sequences. It is strictly command line driven and can run as a daemon with a rather small footprint and low CPU usage.

It is operated mainly via configuration files, though the end video streams can be viewed from a web browser. It can also call to user configurable "triggers" when certain events occur.

Some of Motion's features include:

- Taking snapshots of movement
- Watch multiple video devices at the same time
- Live streaming webcam (using multipart/x-mixed-replace)
- Real time creation of mpeg movies using libraries from ffmpeg
- Take automated snapshots on regular intervals
- Execute external commands when detecting movement
- Motion tracking
- Feed events to a MySQL or PostgreSQL database.
- Feed video back to a loopback for real time viewing
- Lots of user contributed related projects with web interfaces etc.
- User configurable and user defined on screen display.
- Control via browser (older versions used xml-rpc)
- Automatic noise and threshold control
- Motion is a daemon with low CPU consumption and small memory footprint.