



Behavioral Observation Through Image Processing

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Introduction



**Observe
this video
carefully**

- ▶ Many breathing pattern abnormalities **do not happen very frequently**.
- ▶ It requires thorough observation for very long time.

Objectives

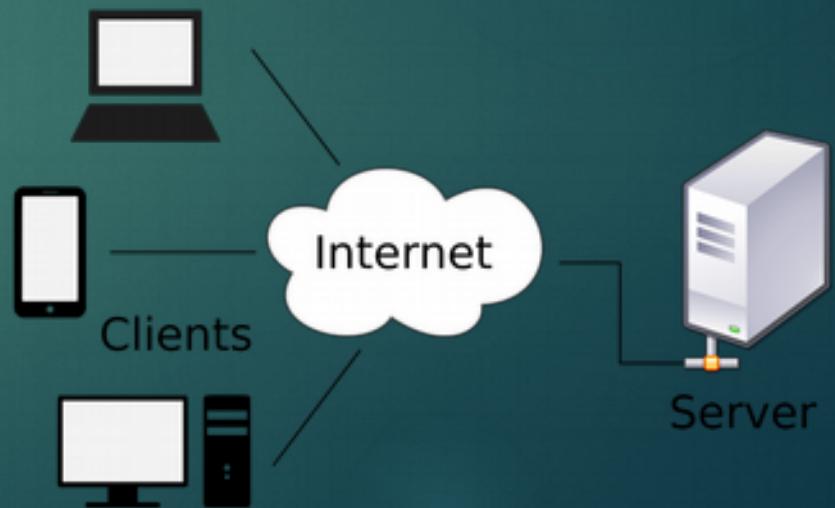
- ▶ Identify those abnormalities and help doctors to do accurate diagnostic.
- ▶ Predict health issues which can arise in future.
- ▶ A method to store video records of the patient.
- ▶ Collect a huge amount of data of breathing patterns to be used for further analyzing and research.

What other people have done

- ▶ **BELLINI** and **AKULLIAN** have done a research on Video Self-Modeling involvements for people with **Autism Spectrum Disorders**
- ▶ **ARROYO, JAVIER** and **BERGASA** have implemented a real-time surveillance system to detect suspicious behaviors in shopping malls.
- ▶ **DONGMIN GUO, VEN** and **ZHOU** recently used optical flow method to track and measure blood cells motion in a human body.

Methodology and Results

- ▶ Research and Prototyping
- ▶ System Implementation



Methodology and Results

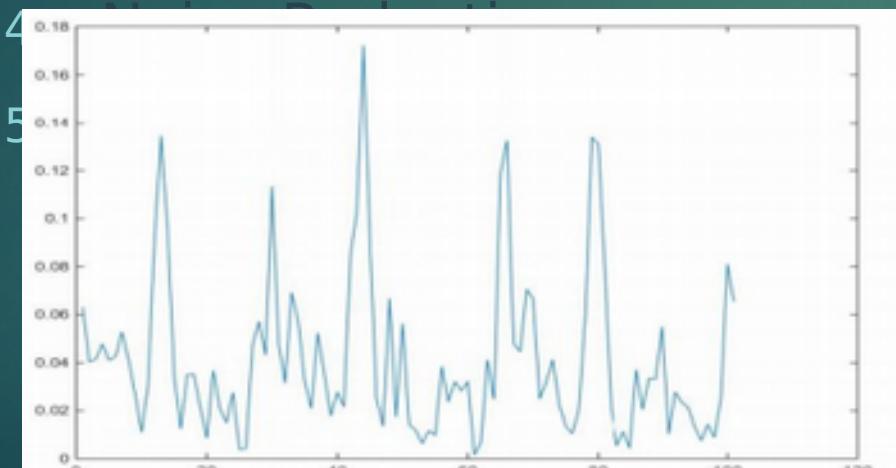
- ▶ Research and Prototyping
 - 1. Data Collecting
 - 2. Motion Analysis
 - 3. Method Comparison
 - 4. Noise Reduction
 - 5. Pattern Identification



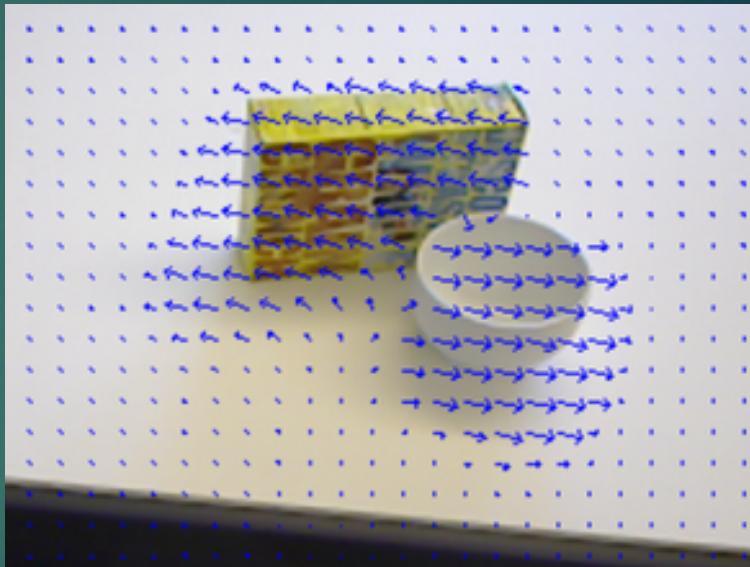
Methodology and Results

► Research and Prototyping

1. Data Collecting
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- Optical Flow Algorithm
- Image Subtraction



$$\text{Avg. Magnitude velocity} = \frac{\sum \text{Magnitude velocity}}{\text{No. of frames}}$$

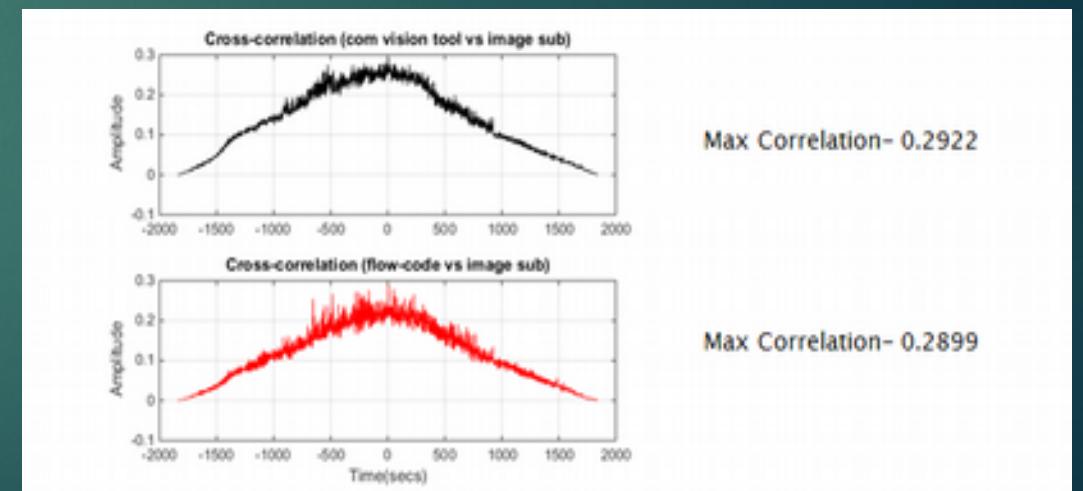
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Method	Accuracy	Speed
Black and Anandan	High	Low
Lucas-Kanade	Medium	Medium
Image Subtraction	Low	High

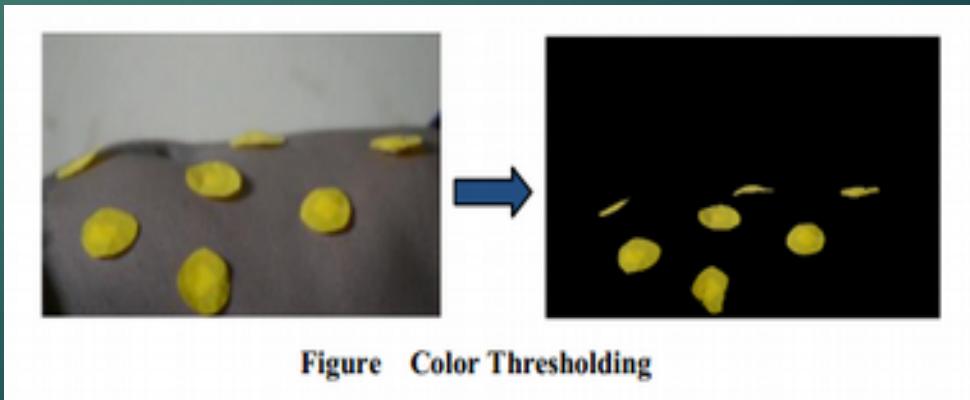
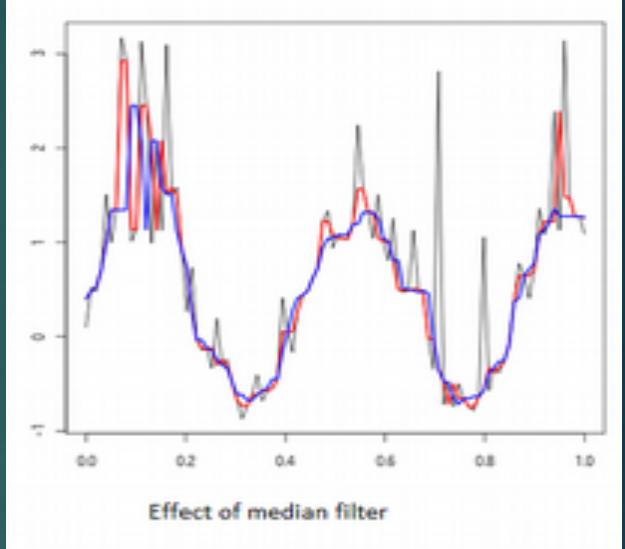
*Optical Flow Algorithm
Black and Anandan dense
Lucas-Kanade
Image Subtraction*

Cross Correlation



Methodology and Results

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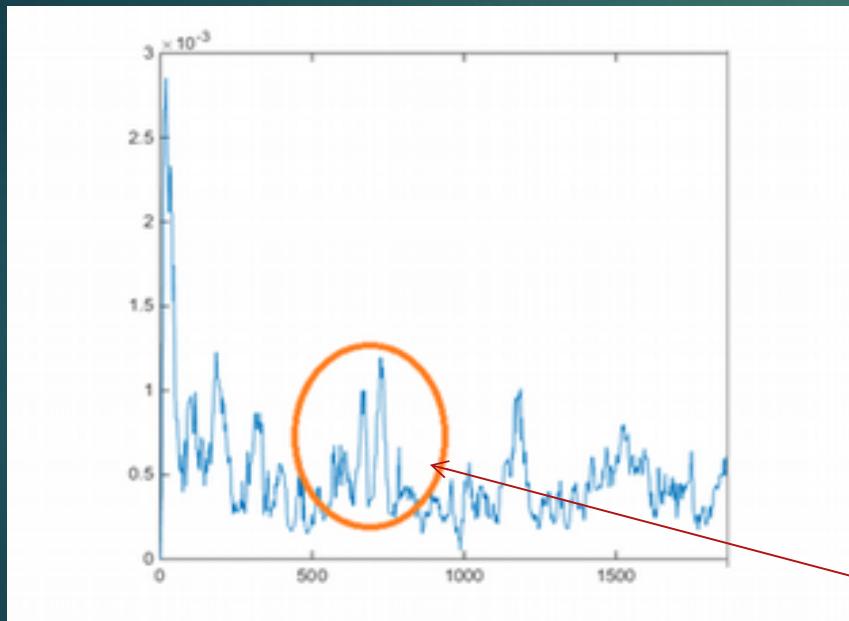


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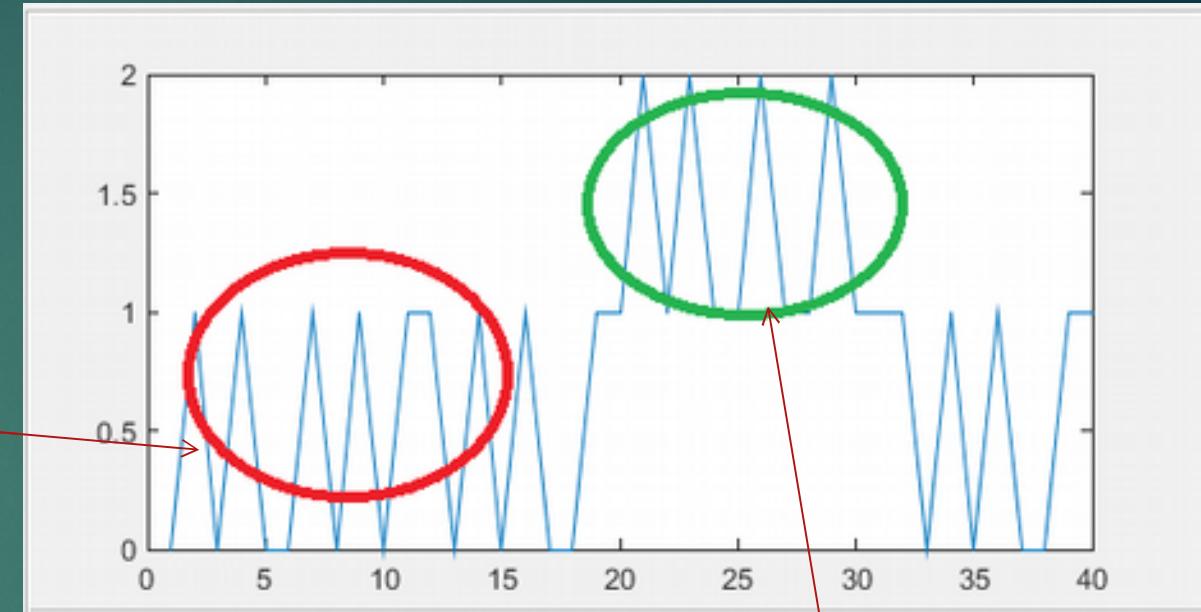
Methodology and Results

► Research and Prototyping



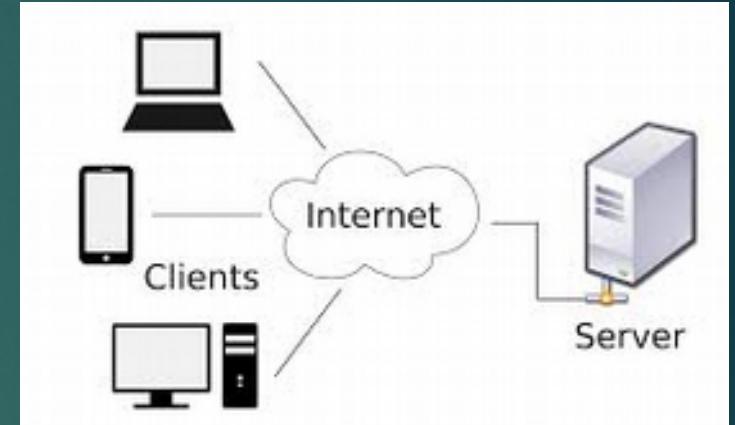
Methodology and Results

- ▶ Research and Prototyping



Methodology and Results

- ▶ System Implementation
 - 1. Client Server Architecture
 - 2. Motion History implementation
 - 3. Optical Flow implementation
 - 4. Machine Learning Analysis

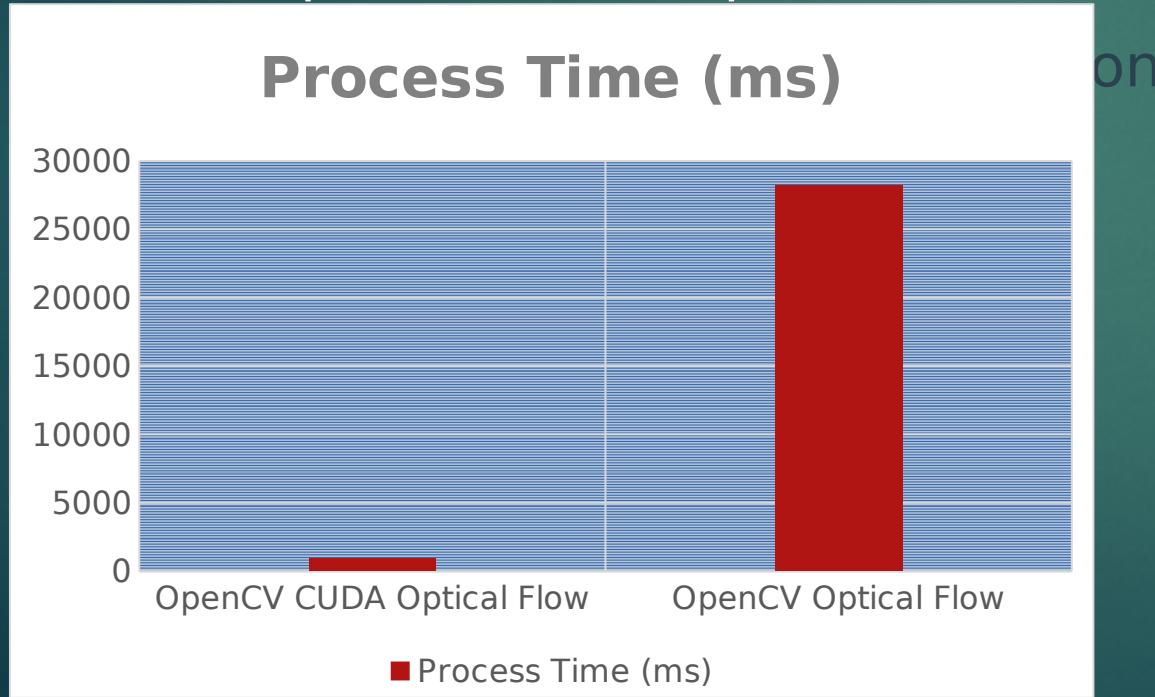


Methodology and Results

GPU version is about 30x faster

- System Implementation
- Client-Server Architecture

2. Optical Flow implementation



- Optical Flow Algorithm takes time

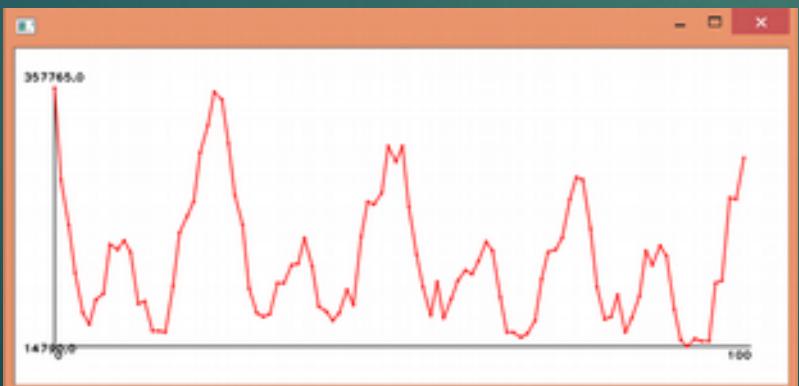


Operation	CPU (ms)	GPU (ms)
Copying 2 images from CPU to GPU	1	
Converting RGB to greyscale	1	0.947
Generating the pyramids	1	0.665
Optical flow	907	904.682
Copying results from GPU to CPU	7	
Total time for OpenCV's cuda optical flow	918	
OpenCV's optical flow (8 threads)	28194	

Methodology and Results

► System Implementation

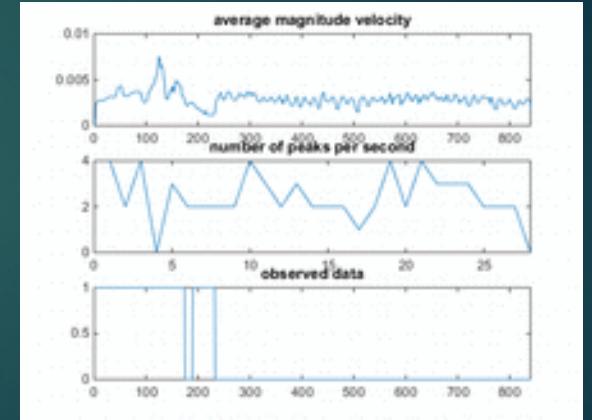
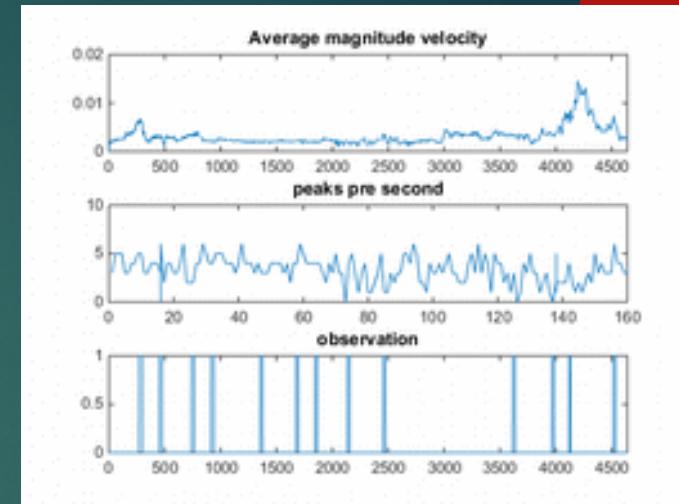
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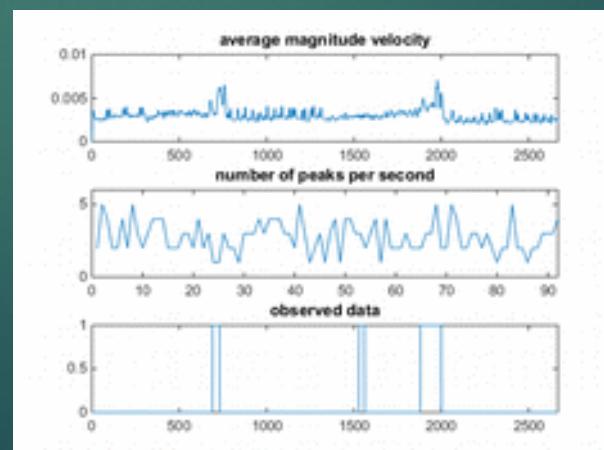
Methodology and Results

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FUTURE WORK





THANK YOU !