

Activity Monitoring Using Smart Glasses



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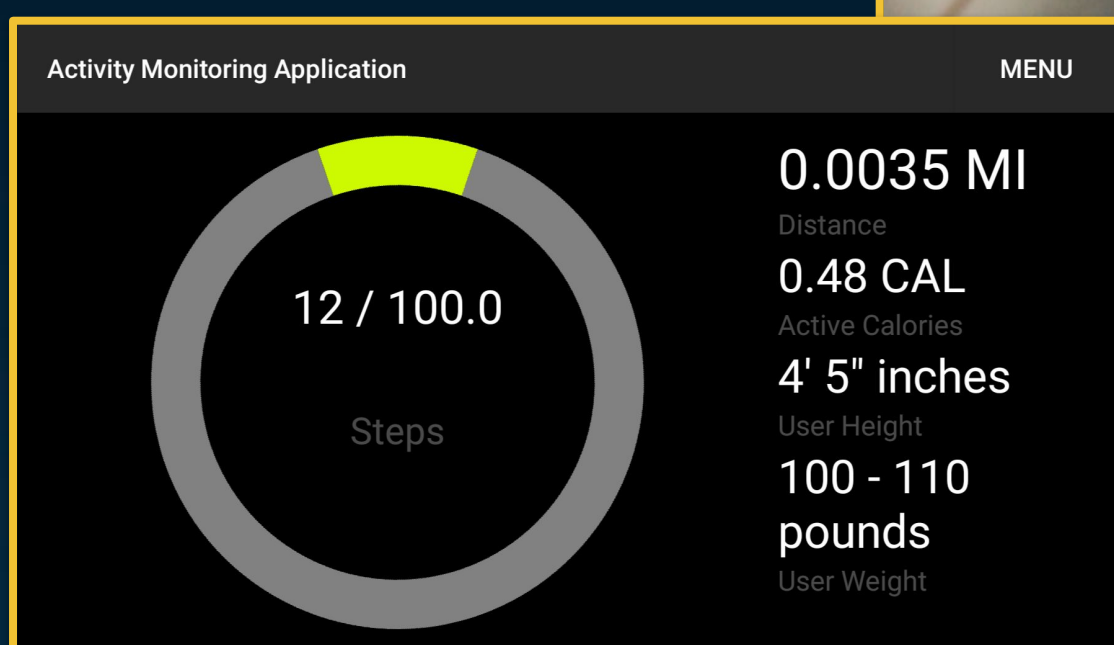
Background

Step-counting applications can be found on every smart phone and smart watch. Usually, they count steps with an 80% (give or take) accuracy.

With our growing technology smart glasses are no longer a niche product. They are growing exponentially in terms of shipments made worldwide. The need for a pedometer on an augmented reality (AR) device is steadily rising.

Objective

To create an activity monitoring application utilizing step-counting as a fundamental unit. The big picture of the project is to create an accurate smart step-counting algorithm used to assist individuals with impaired vision.



Results

10 trials, 100 steps, flat ground.

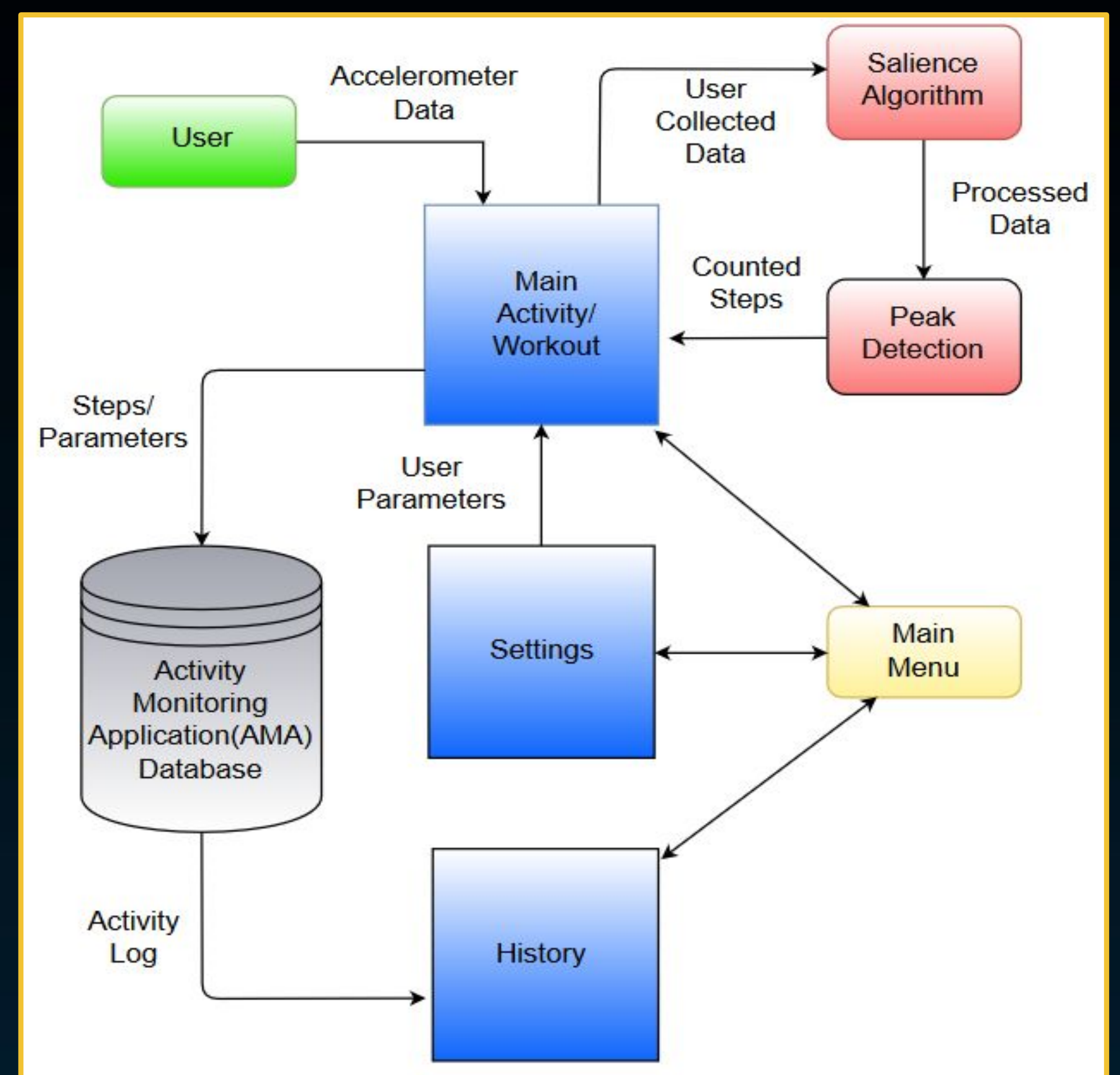
Subject	Peak-to-Peak			Salience		
	Head	Pocket	Foot	Head	Pocket	Foot
1	234	378	132	108	73	107
2	181	416	177	96	77	99
3	170	365	152	88	68	98
4	165	425	166	108	70	106
5	160	461	168	100	63	93
6	167	529	154	95	76	110
7	137	401	155	105	61	105
8	127	532	163	97	81	100
9	120	517	135	97	61	104
10	135	363	154	103	78	101
Average Error %	59.6	338.7	55.6	5.1	29.2	4.3

This data was taken using accelerometer data captured through devices called Shimmers. The static data was then processed through two algorithms (Peak-to-Peak and Peak-to-Peak with an addition of Salience).

Conclusion

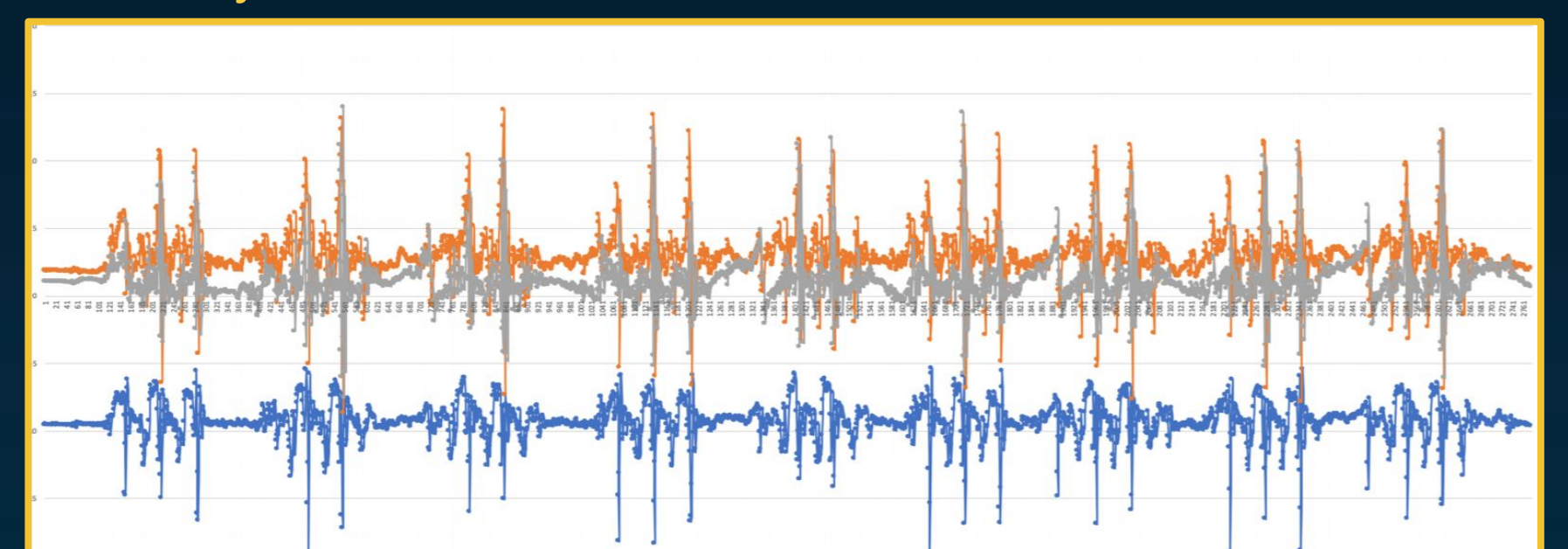
- Achieved higher step-counting accuracy with both static data and dynamic head accelerometer data.
- Achieved higher step-counting accuracy on head mounted display.
- Created a fully functional activity monitoring application with a peak-to-peak step-counting algorithm.

Application Architecture

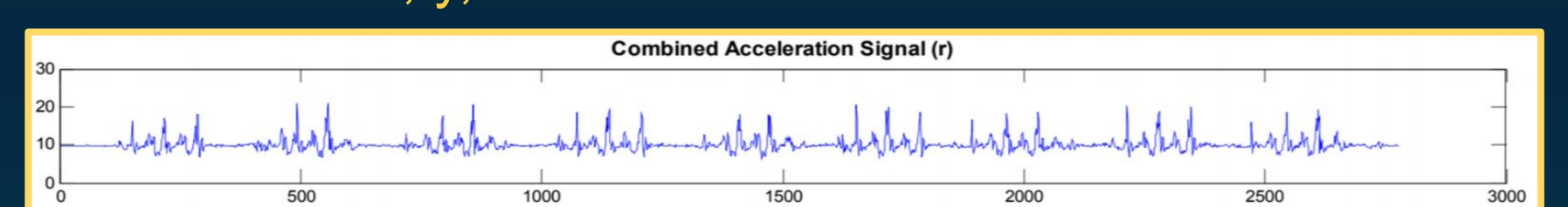


Data Collection

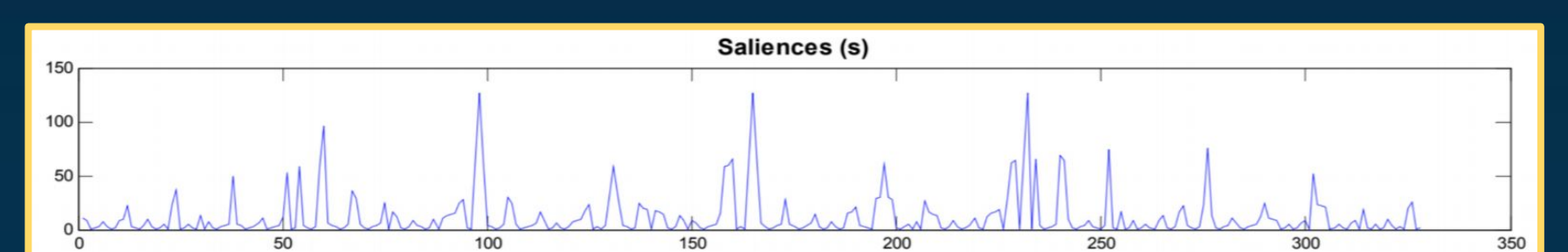
Raw x, y, z data



r: Combined x, y, z data



Saliences of "r"



Algorithm

Peak-to-Peak

Counts every peak in the combined accelerometer data (r). Commonly used in pedometer apps and highly inaccurate.

Salience

An addition to the peak-to-peak algorithm. Begins with smoothing combined data (r) by diminishing and pronouncing specific points. Then calculates the longest interval over which a sample is the maximum.

Software Used

