Virtual Musical Instruments

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Objective

To design and implement an image processing system that takes as input, live video of a user playing a virtual musical instrument and generates appropriate music in real-time.
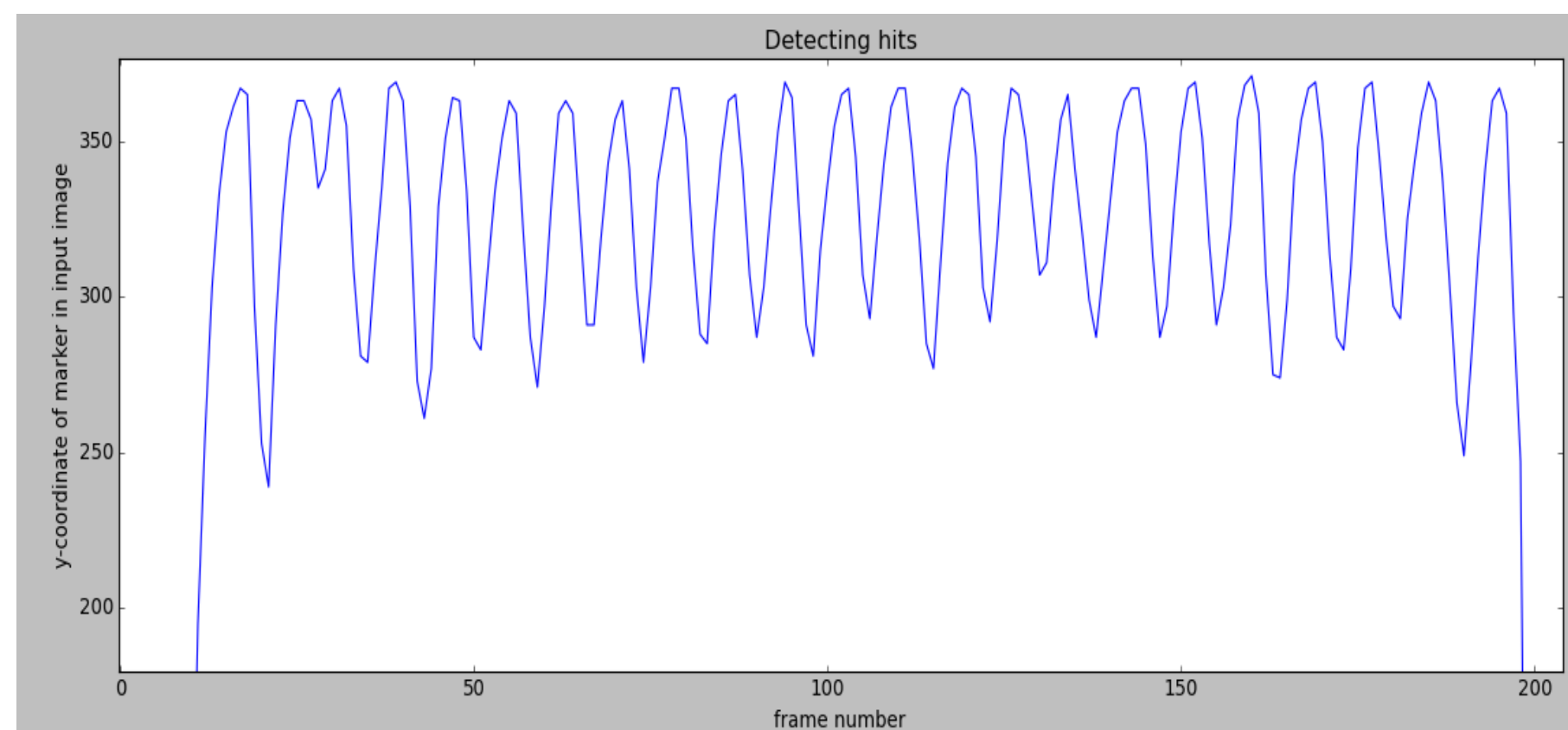
Motivation

- Making music affordable and accessible.
- Eliminating the need to buy a new musical instrument every time you feel like playing a different one.
- Enabling quick design and simulation of creative and innovative musical instruments.

Flow diagram
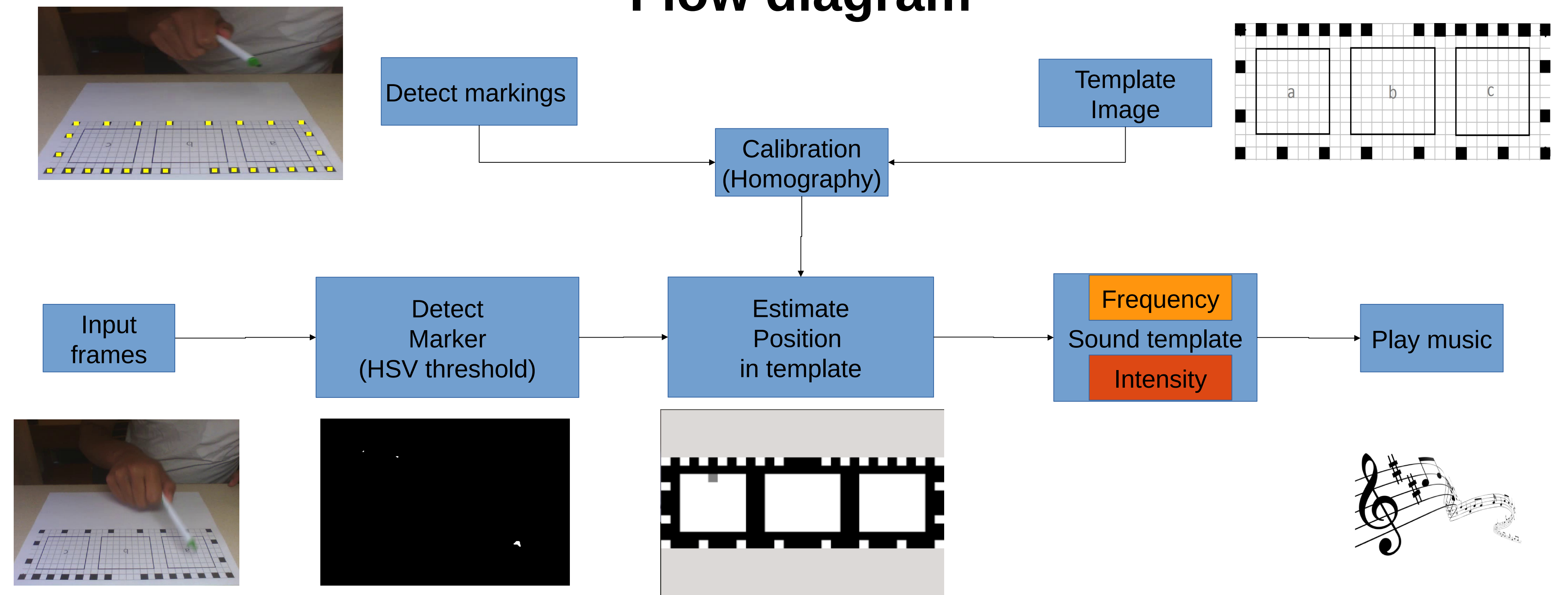
Hit detection method

Sliding window of length 5 to keep track of marker positions.
For frames that do not have marker, linearly interpolate last two positions to get an estimate.
Peak is said to be detected if central position has larger value than others.

Results

Test Video	Correct	Wrong by 1	Accuracy
Piano 1	31	5	86.1 %
Piano 2	9	9	50 %
Piano 3	13	5	72.2 %
Xylo 1	29	7	80.56 %
Xylo 2	16	2	88.89 %
Xylo 3	17	1	94.44 %
Drums 1	28	5	84.85 %
Drums 2	14	8	63.63 %
Drums 3	20	2	90.91 %
Overall	177	44	80.1 %

Future work

- Making calibration robust against lighting and background changes.
- Increasing accuracy of hit-detection process.
- Decreasing latency of entire process.

References

[1] Poupyrev, I., et al. Augmented Groove: Collaborative Jamming in Augmented Reality. in SIGGRAPH'2000.
[2] The Reactable: A Collaborative Musical Instrument. Proceedings of the 2006 Workshop on 'Tangible Interaction in Collaborative Environments' (TICE)