Automated Assessment System for Embodied Cognition in Children

Computer Vision (6367) Project - Spring 2020

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Introduction

- A system that assesses ATEC tasks for measuring cognitive skills in children

- ATEC stands for Activate Test for Embodied Cognition

- Implements RNN on top of CNN layers on data recorded via a Kinect sensor

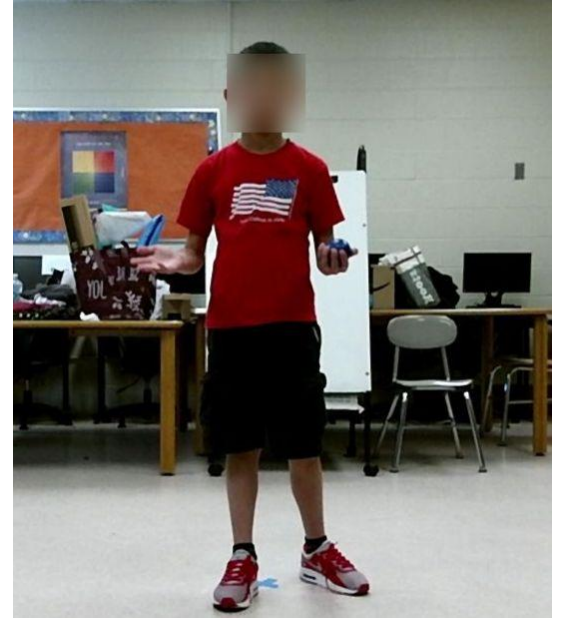- Focuses only on Ball-Drop-to-the-Beat task from the ATEC tasks

Ball-Drop-to-the-Beat Task

and green	ONE, light,	and red	TWO, light,	and yellow	THREE light
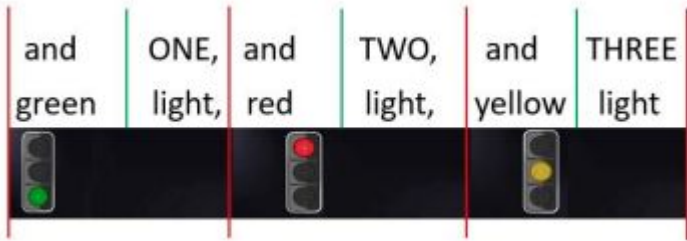
Green Light: Pass the ball

Red Light: No Pass

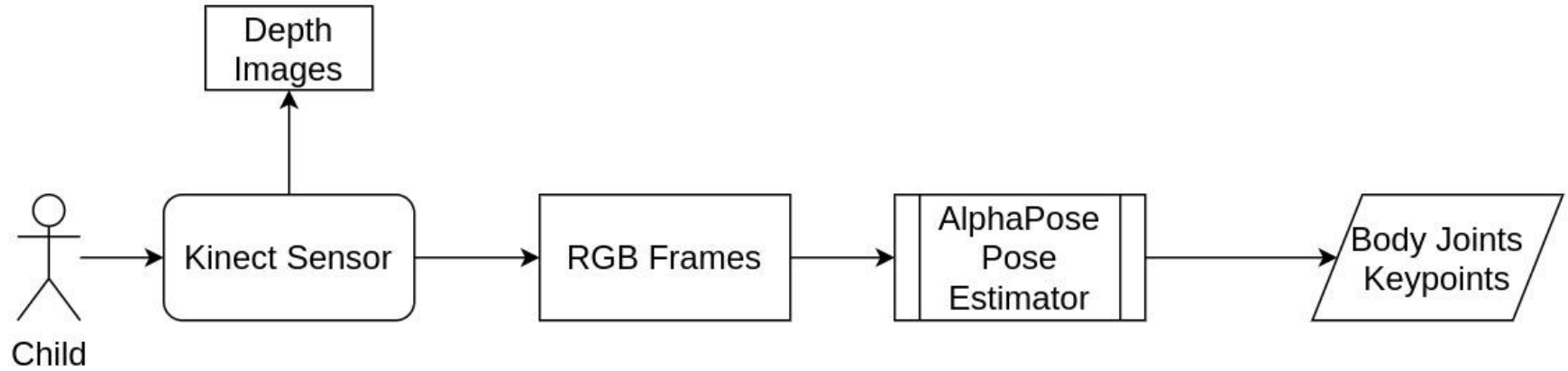Yellow Light: Raise the hand that has the ball

System Architecture I

Fig 1: Data Collection and Body Keypoints Extraction

Body Keypoints from AlphaPose

{0, "Nose"}

{1, "LEye"}

{2, "REye"}

{3, "LEar"}

{4, "REar"}

{5, "LShoulder"}

{6, "RShoulder"}

{7, "LElbow"}

{8, "RElbow"}

{9, "LWrist"}

{10, "RWrist"}

{11, "LHip"}

{12, "RHip"}

{13, "LKnee"}

{14, "Rknee"}

{15, "LAnkle"}

{16, "RAnkle"}

The ones highlighted in RED are the ones that were selected as input for our Deep Neural Network

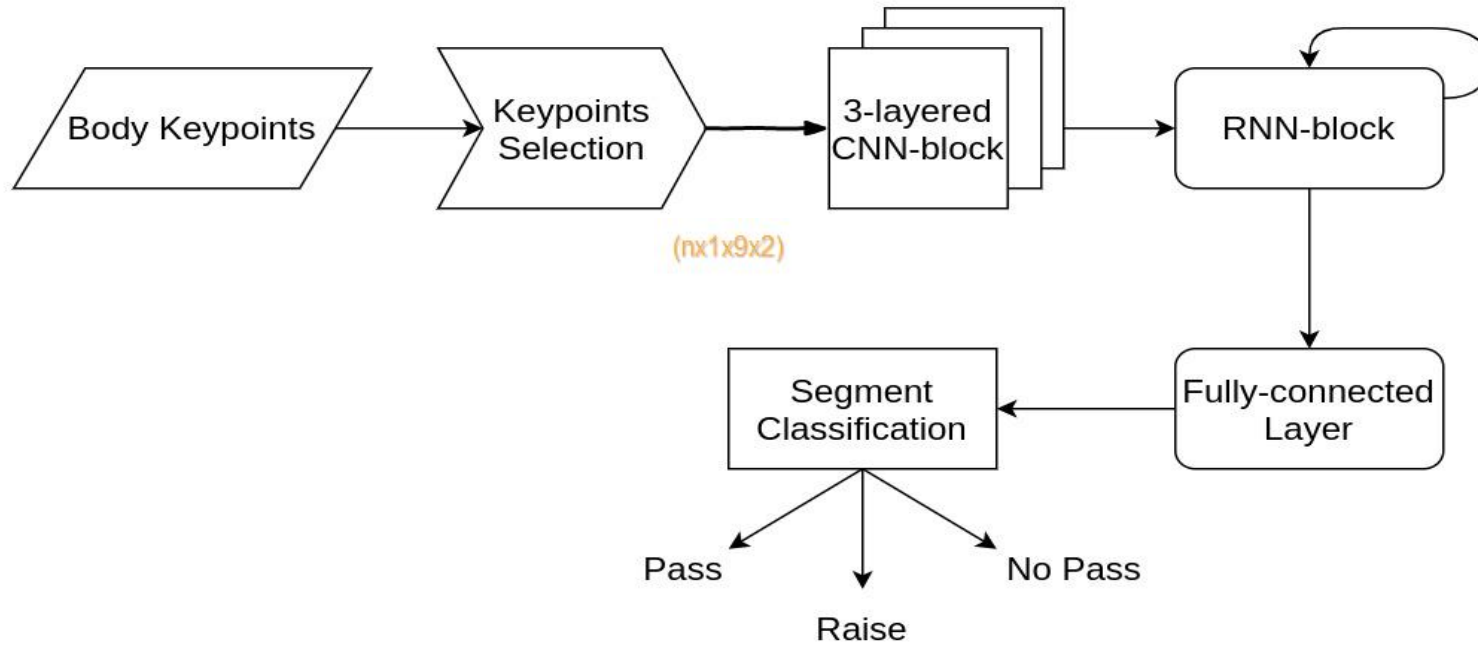# System Architecture II

Fig 2: Model for Segment Classification

Model Evaluation

- Training data size: 2908 and Testing data size: 300

- Test Accuracy: **87%**

- Confusion Matrix:

Pass	No Pass	Raise Hand
92	7	1
10	86	4
13	6	81

Applications

- Helps in reducing manual labor in annotating and assessing video segments containing ATEC tasks

- Activity recognition for other tasks with a different dataset.

- Detection of early stages in cognitive disorders like developmental/motor skill disorders.

- Monitoring the progress of an individual in pre-post intervention studies of ATEC tasks.

Conclusion and Future Enhancements

- Extension for the generalization of activity recognition for any task

- Discriminant validity will be determined comparing community samples with ADHD and ASD samples.

- Development of an adult version for use with mild to moderate TBI, Parkinson's Disease and other movement disorders.

- Pre-post intervention studies to determine ATEC sensitivity to interventions and to study course of illness.

References

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THANK YOU