

Kinder-Gator: The UF Kinect Database of Child and Adult Motion

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Disney Pixar characters (Image courtesy of www.wallpapercave.com)

Existing Datasets

- **Datasets of Adult motions**

- MOBO (Gross and Shi, Tech Rep'01)
- MADS (Kolykhalova et al., INTETAIN'16)
- G3D (Bloom et al., CVPR '12)
- K3Da (Leightley et al., APSIPA '15)
- OTHER DATASETS (van Boxtel)

- **Datasets of Child-like motions**

- MPI Database (Volkova et al., PLoS ONE'14)



C. Adult expressing pride (Volkova et al. '14)

Addressing the Limitations of Existing Datasets

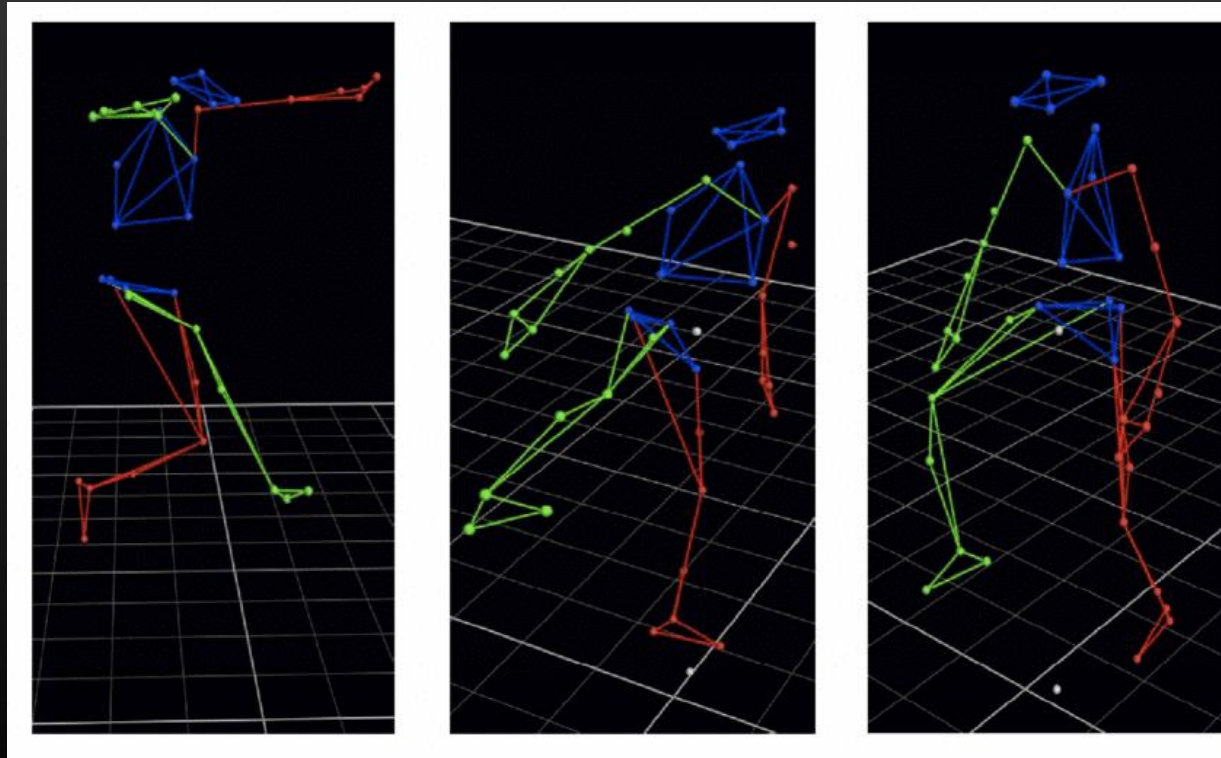
- Movements and Poses of Children differ from those of adults (Animation Addicts '13)



The Human Motion Database: A Cognitive and Parametric Sampling of Human Motion [9]

Guerra-Filho and Biswas (2012)

- 50 children and adults (ages 7 to 82) and 70 actions (e.g., walk, wave)



Example gestures: Jump, Kick, and Step Up

Addressing the Limitations of Existing Datasets



Kinder-Gator

A **Kinect** database of **10 Children** and **10 adults**
performing **58 Motions Naturally**

<https://jainlab.cise.ufl.edu/pose-perception.html>



Motions in Kinder-Gator

Full-Body Motion-Based Game Interaction for Older Adults

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Full Body Gestures Enhancing a Game Book for Interactive Story Telling

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Abstract. Game Books can offer a well-written, but non-linear story, as readers always have to decide, how to continue after reading a text passage. It seems very logical to adopt such a book to investigate interaction paradigms for an interactive storytelling scenario. Nevertheless, it is not easy to keep the player motivated during a long-winded narrated story until the next point of intervention is reached. In this paper we tested

that playing games can have positive effects on the emotional and physical well-being of elderly persons, and can motivate them to maintain a basic level of activity [4, 17]. The latest generation of game input devices, such as Microsoft Kinect, provides an opportunity for motivating physical activity. However, commercially available games put older adults at risk of injury by failing to accommodate for their range of abilities. In addition, there are no guidelines for designing gesture-based games for this particular group, and applying traditional HCI guidelines is difficult because games require special consideration to balance the difficulty needed to bring challenge

A Full-Body Gesture Database for Automatic Gesture Recognition

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Abstract

This paper presents a full-body gesture database containing 2D video data and 3D motion data of 14 gestures, 10 abnormal gestures and 30 commands for 20 subjects. We call this database the Korea City Gesture (KUG) database. Using 3D motion and 3 sets of stereo cameras, we captured 3D data and 3 pairs of stereo-video data at 5 different directions for normal and abnormal gestures. In case of command gestures, 2 pairs of stereo-video data is obtained by 2 sets of stereo cameras with different focal length in order to effectively capture views of whole body

pose [7][9]. However, there are few upper body gestures are supported. Capturing lower-body data mainly for individual identification [6]. Gait captured at different directions under environments and used for gait rec [2][8][12]. In spite of many restrictions such as self occlusion among body components, gesture have been performed on due to the low complexity and the acquisition [6][9]. The 2D gesture captured with video cameras on bl

A Real-Time Approach to the Spotting, Representation, and Recognition of Hand Gestures for Human-Computer Interaction

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Received June 19, 2001; acc

Aiming at the use of hand gestures for hu

Web on the Wall: Insights from a Multimodal Interaction Elicitation Study

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ensing technologies like Microsoft's Kinect provide a cost way to add interactivity to large display surfaces, as TVs. In this paper, we interview 25 participants to about scenarios in which they would like to use a web server on their living room TV. We then conduct an interaction-elicitation study in which users suggested rich and gesture interactions for fifteen common web user functions. We present the most popular suggested

Exploring Strategies and Guidelines for Developing Full Body Video Game Interfaces

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ABSTRACT

We present a Wizard-of-Oz study exploring full body video game interaction. Using the commercial video game Mirror's Edge, players are presented with several different tasks such as running, jumping, and climbing. Following our protocol, participants were given complete freedom in choosing the motions and gestures to complete these tasks. Our experiment results show a mix of natural and constrained gestures adapted to space and field of view restrictions. We present guidelines for future full body interfaces.



Fig. 1: Players are able to explore and experiment

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces—interaction styles; K.8 [Personal Computing]: Games

General Terms

Full-Body, Interaction, Video, Games

Children's Intuitive Gestures in VISION-BASED ACTION GAMES

Participatory Design for Exertion Interfaces for Children

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Mutual Disambiguation of 3D Multimodal Interaction in Augmented and Virtual Reality

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Understanding Visual Interfaces for the Next Generation of Dance-Based Rhythm Video Games

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ABSTRACT

We propose an adaptation of Participatory Design (PD) specifically conceived for full-body interaction design addressing the specificities that this entails. The idea is to include the preferences and points of view of children in the process of designing exergames allowing them to: (a) design activities that foster sufficient physical activity and a rich diversity of movements; (b) link game activities to the needs of the game.

Categories and Subject Descriptors

H.5.1 [Information

A Wizard-of-Oz Elicitation Study Examining Child-Defined Gestures With a Whole-Body Interface

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ABSTRACT

This paper explores the use of a guessability study to examine child-defined gestures with Kinect. Applying a Wizard-of-Oz approach, gestures were elicited from six children (age 3-8) through a series of 22 tasks including object manipulation, navigation-based tasks, and spatial interaction. Gestures were video recorded, transcribed, and coded by three researchers employing an inductive, qualitative method of analysis. Five themes emerged from the data: (1) the influence of 2D

means of prototyping touch-free interactive games with children [9]. Participants were asked to provide gestures for 22 referents while being shown a series of prompts and directives. Gestures and body movements were video recorded, categorized, and coded for the purpose of comparing and contrasting gestures by age, gender, and degree of user familiarity with Kinect.

This paper provides a preliminary examination of the challenges involved in applying the guessability methodology as a means of

2D and 3D Full-Body Gesture Database for Analyzing Daily Human Gestures

Pose presentation for a dance-based massively multiplayer online exergame

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ABSTRACT

A sedentary lifestyle is linked to many health problems, including diabetes, heart disease, and obesity. Active games attempt to offer a solution by encouraging players to be more physically active through the use of entertaining media. We present a framework for a massively multiplayer online exergame (MMOE), that combines elements of pervasive technology and massively multiplayer online exergames to provide players with a customized, social gaming experience with the potential for long-term interest and measurable physical benefits. We then examine our own exergaming system, sensor network for active play (SNAP), to assess its suitability in an MMOE context. We then address several technical and usability challenges in the development of an MMOE, including pose selection, training, recognition, and presentation methods.

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Motions in Kinder-Gator

Warm-Up (9 motions)	Exercise (14)	Mime (16)	Communication (19)
Raise your hand	Put your hands on your hip and lean to the side	Push an imaginary button in front of you	Point at the camera
Wave your hand	Walk in place	Fly like a bird	Motion someone to come here
Bow	Run in place as fast as you can	Kick a ball	Draw a [circle, square, Triangle] in the air
Bend your Knee	Jump as high as you can	Kick a ball as hard as you can	Draw the letter [A,C,K,M,X] in the air
Bend your other Knee	Do Five Jumping Jacks	Climb an imaginary ladder	Make the letter [Y,M,C,A,K,P,T,X] with your body

Example Motions



Warm-up Motions (9)

- Used in day-to-day activities



Example Motions



Exercise Motions (14)

- Induce physical exertion and used in exercise and fitness activities



Mime Motions (16)

- Conceptualize imaginary objects

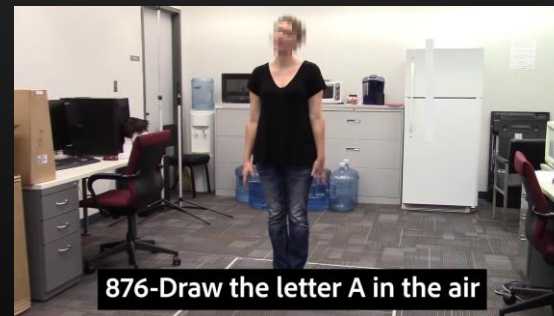
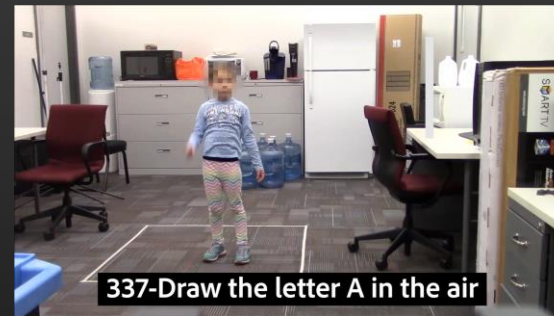


Example Motions



Communication Motions (19)

- Used to convey information

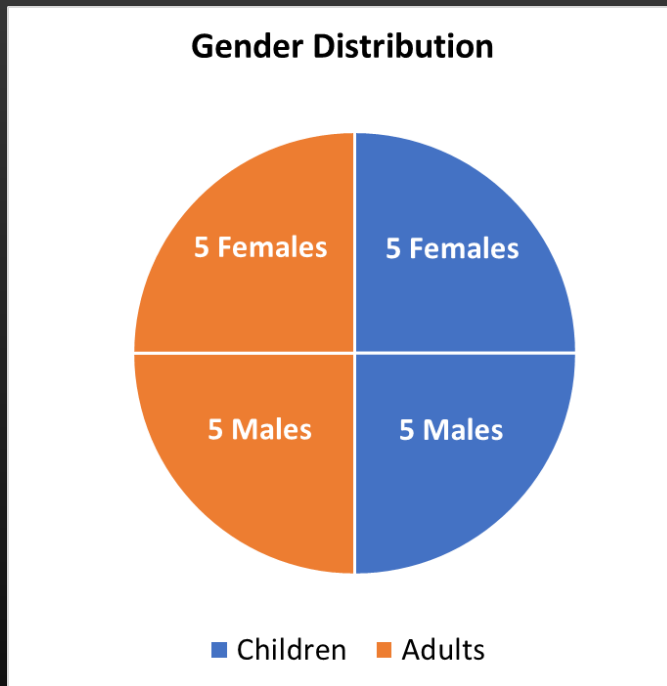


Example Motions

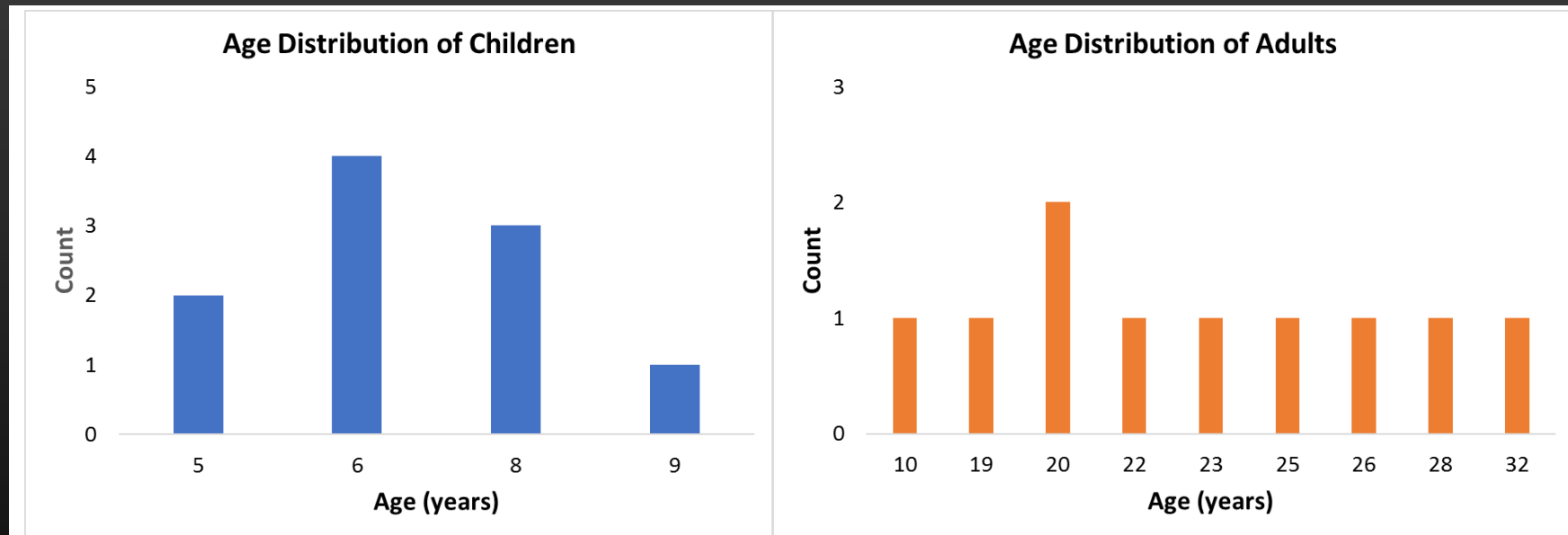


Demographics

Gender



Age

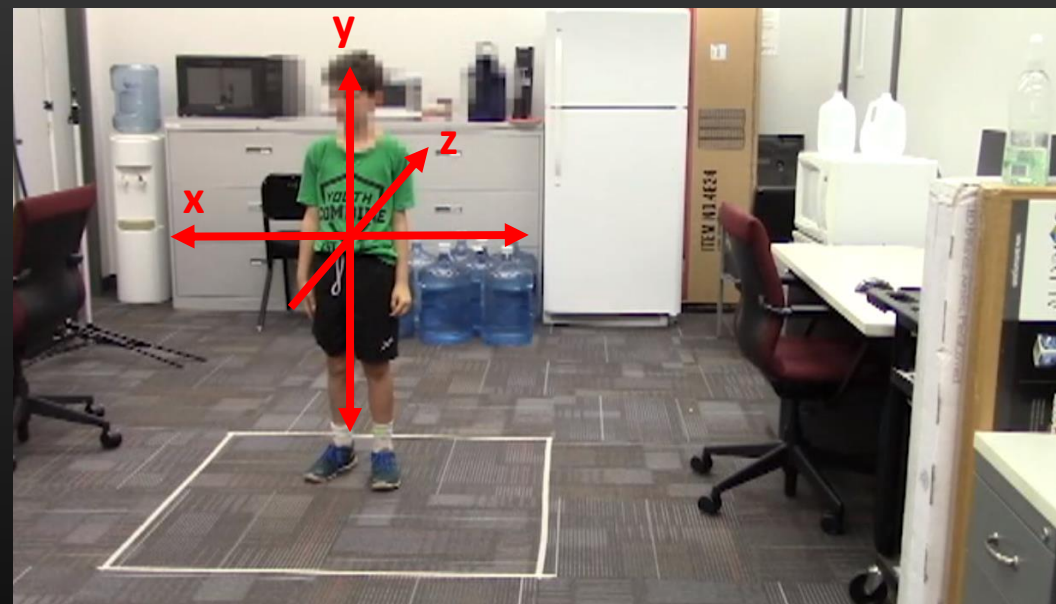
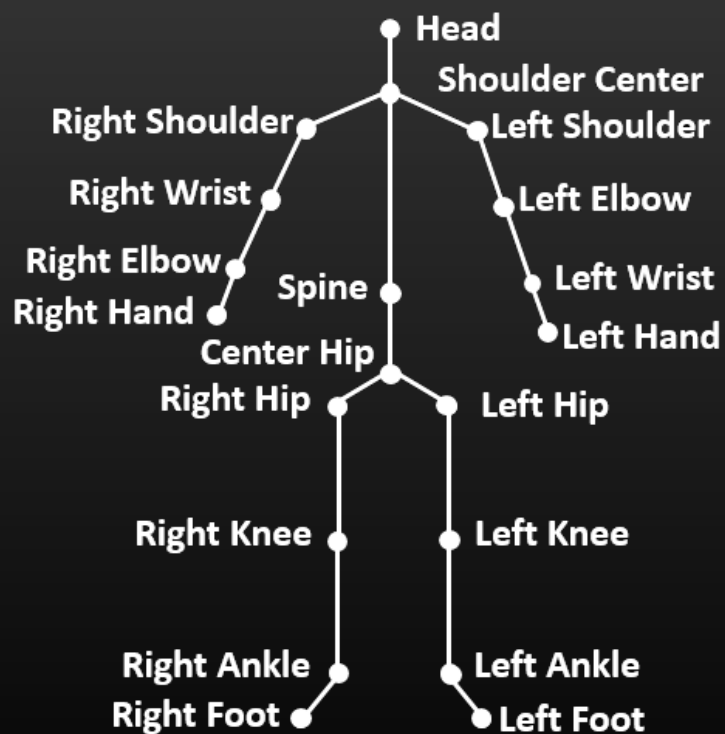


10 Children: M= 6.70 years, SD: 1.42

10 Adults: M = 23.40 years, SD = 4.33

The Kinect v1.0

- Tracks 3D positions of 20 joints along 3 dimensions



Coordinate Frame centered at Kinect



Joints tracked by the Kinect



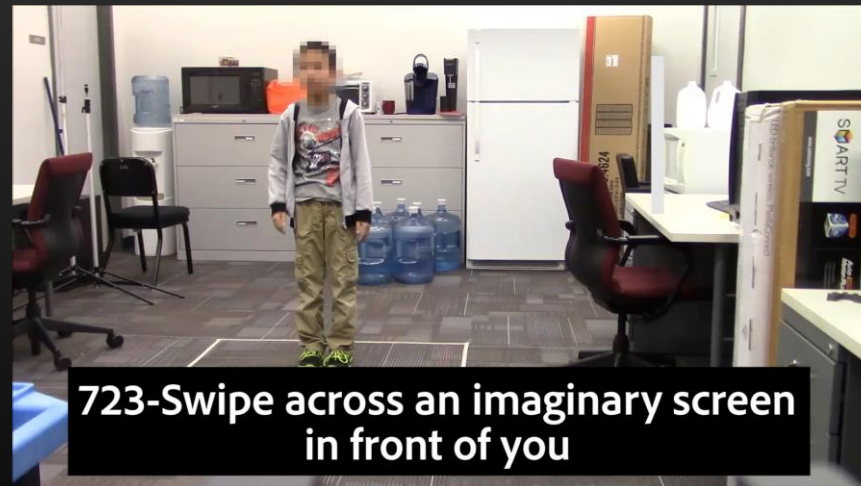
Study Setup

- Participants stood within an area (47 x 47 inches) forward-facing the Kinect
- Duration of motion is dependent on the motion being performed



Study Setup

- Participants stood within an area (47 x 47 inches) forward-facing the Kinect
- Duration of motion is dependent on the motion being performed



Data Collection

- A total of **19 RGB videos** and **1159 motion trials** (58 motions * 20 participants)

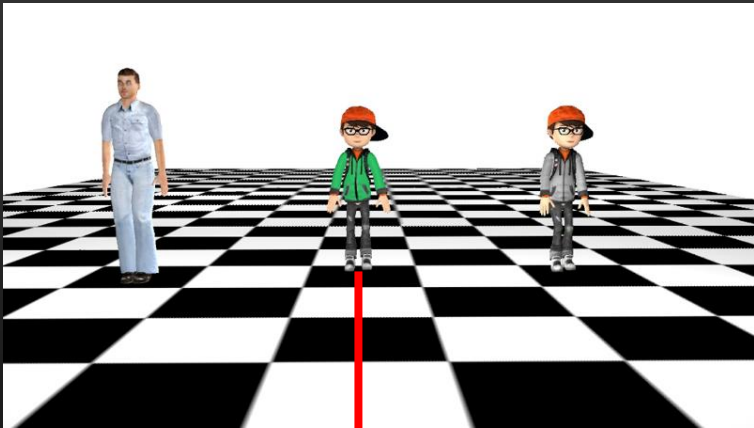
Timestamp	HipCenterX	HipCenterY	HipCenterZ	...	User-ID	Motion
48546673.98	-0.0419986	-0.1512957	3.057717	...	103	Raise-your-hand
48546708.98	-0.04312875	-0.151742	3.058163	...	103	Raise-your-hand
48546740.99	-0.04372106	-0.1516228	3.058321	...	103	Raise-your-hand
48546772.99	-0.0443305	-0.1512319	3.059047	...	103	Raise-your-hand

Dataset Example



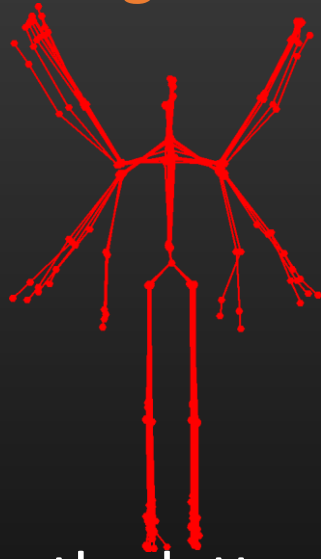
Applications

Animation



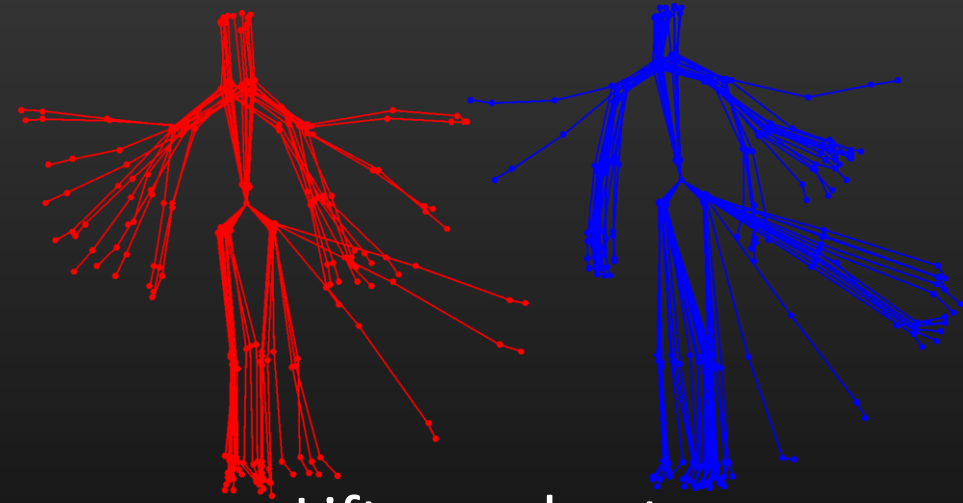
Generate “child-like”
avatar

Recognition



Make the letter “Y”
with your body

Human Motion Characteristics



Lift your leg to
one side motion

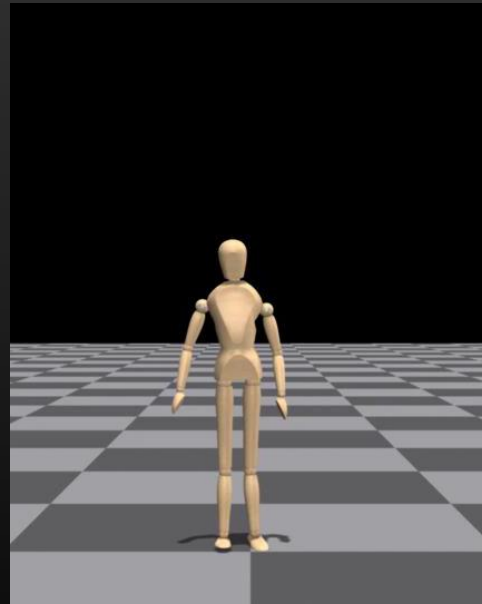


Animation: Cross-Generational Morphing

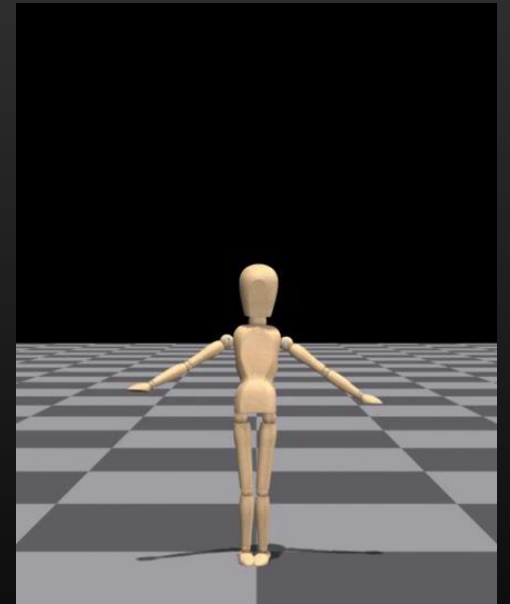
- The dynamic scaling law was used to transform adult motion to child motion (Dong et al. [MIG' 17])



Adult



Dynamically-Scaled
Adult

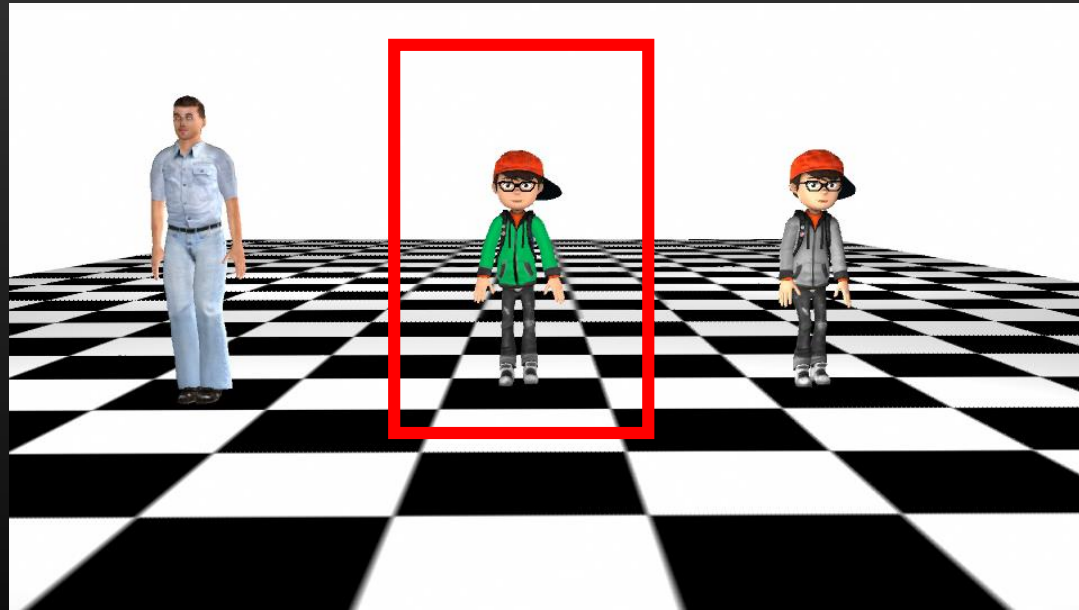


Child



Animation: Cross-generational Morphing

- ‘**Child-like**’ motion created using a style translation algorithm is more similar to the motion of a child (Dong et al. [Eurographics’ 18])

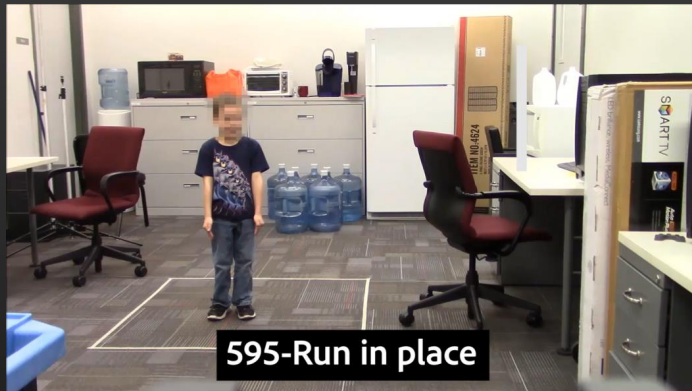


Child in the **middle** is the result of converting adult to child

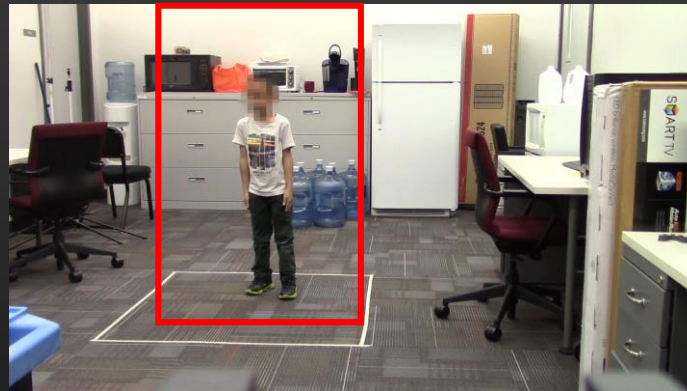
Eurographics Poster Session (Today 12:00-13:15)

Recognition

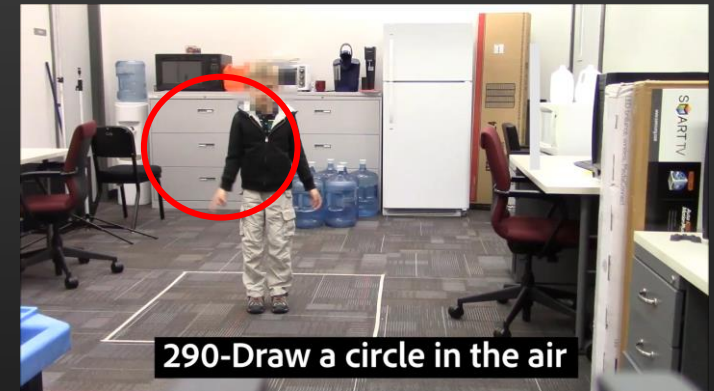
Gait Recognition



Human Activity Recognition



Stroke Gesture Recognition



Jumping Jacks



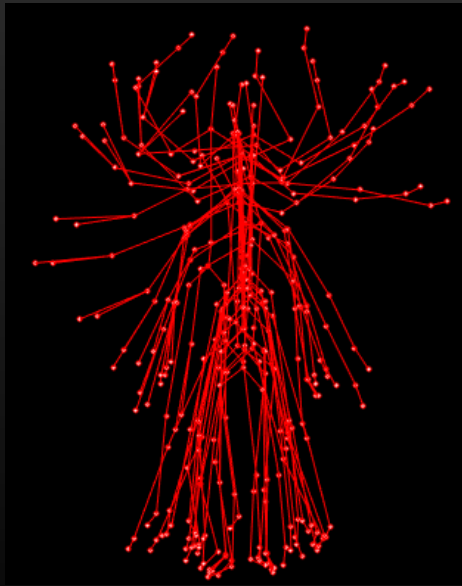
Jump



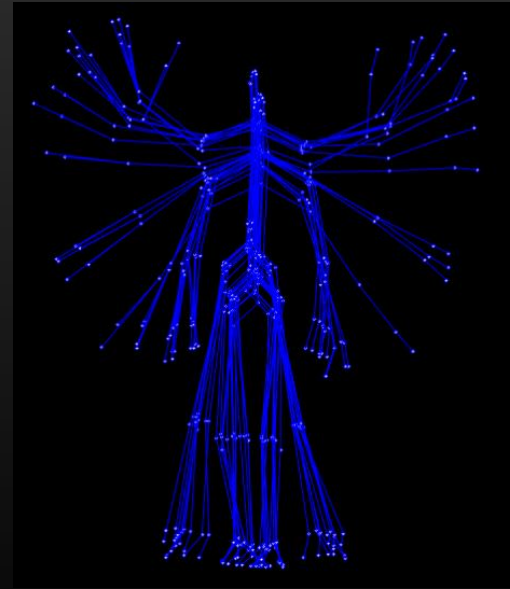
Human Motion Characteristics

- Perceive the differences between child and adult motions (Jain et al. [TAP' 16])

Child



Adult

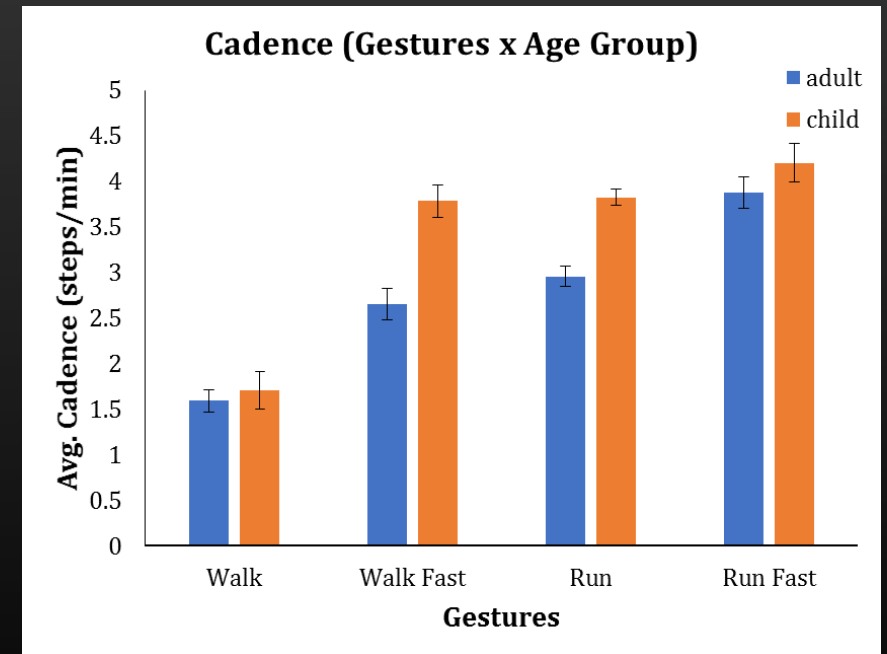


Rendering every 10th frame of the jumping jacks motions for one child and one adult.

Human Motion Characteristics (Ongoing Work)

- Extract spatial and temporal gait features to quantify the differences between child and adult motions (Ongoing work)
- Walk in place, Walk fast, Run, Run fast

Spatial Features	Temporal Features
Step Height	Step Time
Step Width	Cycle Time
Relative Step Height	Cycle Frequency
Walk Ratio	Cadence
	Step Speed



Cadence



Conclusion

- Kinder-Gator is a Kinect database containing 58 motions performed by 10 children (ages 5 to 9) and 10 adults (ages 19 to 32)
- The database contains **19 RGB videos and 1159 motion trials**
- The database is publicly available at:
<https://jainlab.cise.ufl.edu/pose-perception.html>
- Application of the database includes **animation, recognition,** and **human motion characteristics** of children and adults





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Thank You!

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