**Data Set Name:** Three Dimensional Dataset Combining Gait and Full Body Movement of Children with Autism Spectrum Disorders Collected by Kinect v2 Camera

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**Authors:** Ahmed A. Al-Jubouri (stud.ahmed.rahman@uobabylon.edu.iq), Israa Hadi Ali, Yasen Rajihy

College of Information Technology

University of Babylon

Hillah, Iraq

**Abstract:** To the best of our knowledge, this is the maiden attempt to build a three-dimensional dataset that combines gait and body movement analysis of children with Autism Spectrum Disorders (ASD) in controlled environments for fifty children with autism children and fifty typical children. A 3D-skeleton-based dataset includes 3D joints positions, the corresponding skeleton movement video, joints trajectories video captured by Kinect v2, and color videos captured by Samsung Note 9 rear camera. On the other hand, color videos for 9 children suffer from severe autism is also included for scientific benefit. Finally, the dataset includes 700 folders (350 for typical children, 350 for children with ASD) which include 3D files of tracked joints, angles between joints, and skeleton tracking video related to the augmentation of the original dataset based on seven transformations described in the paper. To ensure the best possible achievement, the temperature is measured periodically using a mercury thermometer and it is range (20c - 22c). The ventilation is also good, which prevented the overheating of the camera. The camera is placed away from direct sunlight and to ensure good lighting, the brightness measured frequently using the Lux Light Meter application on Samsung galaxy note nine and it in range (76 Lux - 87 Lux). The Kinect camera is placed at a height of 0.75m. Since a small temperature drift in the Kinect sensor has been reported in section2, the recording was started thirty minutes after the camera had turned on. Children were asked to walk along a line, at normal speed, towards the Kinect camera. The cameras recorded color video and skeleton tracking videos ten times then choosing one suitable gait cycle. Each time the participant walks about two gait cycles in the range of [1.5m to 4m] in front of the camera. Then extracting one gait cycle to use in the following stages.

**Keywords:** Autism Spectrum Disorders, Kinect v2, Gait Analysis, Body Movement Analysis, 3D Dataset, Dataset Augmentation. Time series data.

**Data Type: Descriptive:** Nominal /categorical, binary, continuous, and Time series data.

**Task:** Classification

**Attribute Type:** Categorical, continuous, and binary.

**Area:** Computer Science and Psychology

**Does your data set contain missing values?** No

**Number of Instances (typical development):** 50

**Number of Instances (Autism spectrum disorders):** 50

**Number of Instances After augmentation (typical development):** 400

**Number of Instances After augmentation (Autism spectrum disorders):** 400

**Number of Instances in final dataset (Autism spectrum disorders and typical development):** 800

**Number of Attributes:** 1259

**Relevant Paper:** Generating 3D Dataset of Gait and Full Body Movement of Children with Autism Spectrum Disorders Collected by Kinect V2 Camera

**Journal Information:** COMPUSOFT: An International Journal of Advanced Computer Technology

**Citation Request:** In this research, we described in detail the stages of collecting the dataset:

AbdulRahman, A., Hadi, I., & Rajihy, Y. (2020). Generating 3D dataset of Gait and Full body movement of children with Autism spectrum disorders collected by Kinect v2 camera. COMPUSOFT: An International Journal of Advanced Computer Technology, 9(8), 3791-3797. Retrieved from https://ijact.in/index.php/ijact/article/view/1193

**Data File:** We will submit two file types:

1. Three dimensional joints position in (.xlsx) format
2. RGB video, skeleton video and trajectory video in (.avi) format

**Parents' approval:** The parents signed the Informed Consent Form:

[](Informed%20Consent%20Form%20for%20parents%20of%20children.jpg)

Informed Consent Form.jpg

# Overview Dataset

## Metadata of all participants:

|  |  |  |  |
| --- | --- | --- | --- |
| Typical development | Number of children | mean of Age (year) | mean of length (m) |
| Males | 26 | 7.8 | 3.98 |
| Females | 24 | 5.4 | 3.49 |

|  |  |  |  |
| --- | --- | --- | --- |
| Autism spectrum disorders | Number of children | mean of Age (year) | mean of length (m) |
| Males | 47 | 8.19 | 1.299 |
| Females | 12 | 8.66 | 1.308 |

## Metadata of Typical Participants:

|  |  |  |  |
| --- | --- | --- | --- |
| ID | Gender | Age(years) | Length(m) |
| Case 1 | F | 10 | 4.2 |
| Case 2 | F | 7 | 4 |
| Case 3 | M | 11 | 4.2 |
| Case 4 | M | 5 | 3.8 |
| Case 5 | F | 3 | 3.4 |
| Case 6 | M | 10 | 4.9 |
| Case 7 | M | 2 | 2.8 |
| Case 8 | F | 6 | 3.8 |
| Case 9 | M | 11 | 4.2 |
| Case 10 | F | 5 | 3.3 |
| Case 11 | F | 7 | 4 |
| Case 12 | M | 5 | 3.2 |
| Case 13 | M | 4 | 3.2 |
| Case 14 | F | 3 | 3.1 |
| Case 15 | F | 5 | 3.5 |
| Case 16 | F | 6 | 3.8 |
| Case 17 | F | 5 | 3.9 |
| Case 18 | M | 5 | 4 |
| Case 19 | M | 4 | 3.2 |
| Case 20 | F | 10 | 4.2 |
| Case 21 | F | 4 | 3.3 |
| Case 22 | F | 3 | 3.7 |
| Case 23 | F | 2 | 2.5 |
| Case 24 | M | 6 | 3.8 |
| Case 25 | M | 7 | 3.5 |
| Case 26 | F | 4 | 3.2 |
| Case 27 | F | 4 | 3.2 |
| Case 28 | F | 2 | 1.2 |
| Case 29 | F | 5 | 3.5 |
| Case 30 | F | 11 | 4 |
| Case 31 | M | 11 | 4.3 |
| Case 32 | M | 7 | 4.1 |
| Case 33 | M | 10 | 5 |
| Case 34 | M | 6 | 3.6 |
| Case 35 | M | 5 | 3.2 |
| Case 36 | M | 6 | 4 |
| Case 37 | M | 10 | 4.1 |
| Case 38 | F | 4 | 3.1 |
| Case 39 | M | 6 | 3.8 |
| Case40 | F | 4 | 3.2 |
| Case 41 | F | 6 | 3.8 |
| Case 42 | M | 6 | 3.8 |
| Case 43 | M | 9 | 4.1 |
| Case 44 | F | 6 | 3.8 |
| Case 45 | F | 9 | 4.1 |
| Case 46 | M | 14 | 4.5 |
| Case 47 | M | 11 | 4.8 |
| Case 48 | M | 13 | 5 |
| Case 49 | M | 12 | 4.8 |
| Case 50 | M | 6 | 3.8 |

## Metadata of Participants with ASD Information:

|  |  |  |  |
| --- | --- | --- | --- |
| ID | Gender | Age(years) | Length(m) |
| Case 1 | F | 13 | 1.524390244 |
| Case 2 | M | 9 | 1.280487805 |
| Case 3 | M | 7 | 1.219512195 |
| Case 4 | M | 8 | 1.341463415 |
| Case 5 | M | 8 | 1.31097561 |
| Case 6 | M | 9 | 1.432926829 |
| Case 7 | M | 9 | 1.219512195 |
| Case 8 | M | 10 | 1.432926829 |
| Case 9 | M | 11 | 1.432926829 |
| Case 10 | M | 10 | 1.280487805 |
| Case 11 | M | 9 | 1.18902439 |
| Case 12 | M | 8 | 1.524390244 |
| Case 13 | F | 10 | 1.432926829 |
| Case 14 | M | 5 | 1.31097561 |
| Case 15 | M | 6 | 1.25 |
| Case 16 | M | 9 | 1.219512195 |
| Case 17 | M | 9 | 1.37195122 |
| Case 18 | M | 6 | 1.219512195 |
| Case 19 | M | 7 | 1.280487805 |
| Case 20 | M | 7 | 1.31097561 |
| Case 21 | M | 8 | 1.432926829 |
| Case 22 | M | 9 | 1.3210567 |
| Case 23 | M | 9 | 1.2986324 |
| Case 24 | F | 9 | 1.37195122 |
| Case 25 | M | 9 | 1.219512195 |
| Case 26 | M | 10 | 1.463414634 |
| Case 27 | F | 9 | 1.067073171 |
| Case 28 | M | 13 | 1.585365854 |
| Case 29 | M | 10 | 1.463414634 |
| Case 30 | F | 8 | 1.219512195 |
| Case 31 | M | 13 | 1.707317073 |
| Case 32 | M | 15 | 1.676829268 |
| Case 33 | M | 6 | 1.219512195 |
| Case 34 | M | 10 | 1.280487805 |
| Case 35 | M | 12 | 1.463414634 |
| Case 36 | M | 6 | 1.18902439 |
| Case 37 | M | 7 | 1.219512195 |
| Case 38 | M | 5 | 0.975609756 |
| Case 39 | F | 5 | 1.219512195 |
| Case40 | M | 10 | 1.524390244 |
| Case 41 | M | 7 | 1.280487805 |
| Case 42 | M | 7 | 1.280487805 |
| Case 43 | M | 9 | 1.37195122 |
| Case 44 | F | 10 | 1.463414634 |
| Case 45 | M | 6 | 0.975609756 |
| Case 46 | M | 10 | 1.280487805 |
| Case 47 | M | 7 | 1.25 |
| Case 48 | M | 8 | 1.463414634 |
| Case 49 | F | 6 | 1.067073171 |
| Case 50 | M | 8 | 1.280487805 |

## Metadata of Participants with Severe level of ASD

|  |  |  |  |
| --- | --- | --- | --- |
| ID | Gender | Age(years) | Length(m) |
| Case 1 | F | 15 | 1.676829268 |
| Case 2 | M | 3 | 0.914634146 |
| Case 3 | F | 8 | 1.25 |
| Case 4 | M | 6 | 1.158536585 |
| Case 5 | F | 6 | 1.280487805 |
| Case 6 | M | 5 | 0.975609756 |
| Case 7 | M | 5 | 0.975609756 |
| Case 8 | F | 5 | 1.12804878 |
| Case 9 | M | 5 | 1.219512195 |

## Features captured with the Kinect v2 camera

1. **Joints:**

|  |  |  |  |
| --- | --- | --- | --- |
| no. | joint | no. | joint |
| 1 | Head | **14** | Hand Tip Left |
| 2 | Neck | **15** | Hand Tip Right |
| 3 | Spine Shoulder | **16** | Spine Mid |
| 4 | Shoulder Left | **17** | Spine Base |
| 5 | Shoulder Right | **18** | Hip Left |
| 6 | Elbow Left | **19** | Hip Right |
| 7 | Elbow Right | **20** | Knee Left |
| 8 | Wrist Left | **21** | Knee Right |
| 9 | Wrist Right | **22** | Ankle Left |
| 10 | Thumb Left | **23** | Ankle Right |
| 11 | Thumb Right | **24** | Foot Left |
| 12 | Hand Left | **25** | Foot Right |
| 13 | Hand Right |  |  |

1. **Angles:**

|  |  |  |
| --- | --- | --- |
| no. | Abbreviation | Description |
| 1 | HESHL | Left Angle of Spine Shoulder between (Head, Left Shoulder) |
| 2 | HESHR | Right Angle of Spine Shoulder between (Head, Right Shoulder) |
| 3 | SPELL | Angle of Shoulder Left between (Spine Shoulder, Left Elbow) |
| 4 | SPELR | Angle of Shoulder Right between (Spine Shoulder, Right Elbow) |
| 5 | SHWRL | Angle of Left Elbow between (Left Shoulder, Left Wrist) |
| 6 | SHWRR | Angle of Right Elbow between (Right Shoulder, Right Wrist) |
| 7 | ELHAL | Angle of Left Wrist between (Left Elbow, Left Hand) |
| 8 | ELHAR | Angle of Right Wrist between (Right Elbow, Right Hand) |
| 9 | THHAL | Angle of Left Wrist between (Left Thumb, Left Hand) |
| 10 | THHAR | Angle of Right Wrist between (Right Thumb, Right Hand) |
| 11 | SPKNL | Angle of Left Hip between (Spine Base, Left Knee) |
| 12 | SPKNR | Angle of Right Hip between (Spine Base, Right Knee) |
| 13 | HIANL | Angle of Left Knee between (Left Hip, Left Ankle) |
| 14 | HIANR | Angle of Right Knee between (Right Hip, Right Ankle) |
| 15 | KNFOL | Angle of Left Ankle between (Left Knee, Left Foot) |
| 16 | KNFOR | Angle of Right Ankle between (Right Knee, Right Foot) |

## Features included in final dataset

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Abbreviation | Example | Description | Type | Unit |
| mean-coordination-Joint | mean-x-Midspain | Mean of x, y, and z coordination of 25 body joints | Floating-point | m |
| variance-coordination-Joint | variance-x-Midspain | Variance of x, y, and z coordination of 25 body joints | Floating-point | m2 |
| std-coordination-Joint | std-x-Midspain | Standard deviation of x, y, and z coordination of 25 body joints | Floating-point | m |
| mean Angle | mean HESHL | Mean of 16 angles between body joints | Floating-point | deg |
| variance Angle | variance HESHL | Variance of 16 angles between body joints | Floating-point | deg2 |
| std Angle | std HESHL | Standard deviation of 16 angles between body joints | Floating-point | deg |
| mean joint1 T Joint2 | mean MidTFoL | Mean of distance between body joints | Floating-point | m |
| variance joint1 T Joint2 | variance MidTFoL | Variance of distance between body joints | Floating-point | m2 |
| std joint T Joint2 | std MidTFoL | Standard deviation of distance between body joints | Floating-point | m |
| Mean Joint TGr | mean AnkLTGr | Mean of distance between Joints and ground | Floating-point | m |
| variance Joint TGr | variance AnkLTGr | Variance of distance between Joints and ground | Floating-point | m2 |
| std Joint1 TGr | std AnkLTGr | Standard deviation of distance between Joints and ground | Floating-point | m |
| Rom Joint coordination | RomMidx | Range of movement of 25 joint on x and y coordination | Floating-point | m |
| MaxStLe |  | Maximum stride length | Floating-point | m |
| MaxStWi |  | Maximum stride width | Floating-point | m |
| StrLe |  | Stride length | Floating-point | m |
| GaCT |  | Gait cycle time | Time | ms |
| StaT |  | Stance time | Time | ms |
| SwiT |  | Swing time | Time | ms |
| Velocity |  | Velocity | Floating-point | m/s |
| HaTiLPos |  | Hand Tip left position relative to SpanBase  0 if HandTipLeft.y under SpanBase.y and 1 otherwise | Binary (0, 1) |  |
| HaTiRPos |  | Hand Tip Right position relative to SpanBase  0 if HandTipRight.y under SpanBase.y and 1 otherwise | Binary (0, 1) |  |
| MaxDBFE and MinDBFE |  | Maximum and minimum distance between feet | Floating-point | m |
| Threshold |  | Using in extract one gait cycle:  =(Max(distance between feet) + Min(distance between feet))/2 | Floating-point | m |