1. **POSBAN Dataset**

Experiments were carried out on four different human subjects for observing the impact of postural mobility on network partitioning. The subjects taken were of mean height 170 cm plus minus standard deviation and of mean age years plus minus standard deviation with the following characteristics shown in Table 1.

Table 1 : Human subject characteristics

|  |  |  |  |
| --- | --- | --- | --- |
| Subject | Age (years) | Height (cm) | Average walking speed (m/sec) |
| 1 | 40 | 176 | 0.95 |
| 2 | 32 | 171 | 0.85 |
| 3 | 21 | 162 | 0.93 |
| 4 | 27 | 168 | 0.97 |

**1.1 Video Sample acquisition**

We captured video samples of each subject when he was walking freely for around 5 meters with 2-D full HD camera having properties given in Table 2.

Table 2 : Properties of 2-D Camera

|  |  |
| --- | --- |
| Frame width | 640 |
| Frame height | 480 |
| Data rate | 11911 kbps |
| Total bit rate | 12000 kbps |
| Frame rate | 29 frames/sec |

26 video samples were captured for each human in which first 13 videos were obtained when he was walking from right to left followed by next 13 videos when he was walking from left to right. Each video sample was of 3 to 4 seconds interval.

**1.2 Frame Extraction**

Each video sample was of about 120 frames out of which 9 to 11 frames were extracted with a gap of 7 frames as shown in the Figure 1.

combine.tif

Fig.1 Subject 4 is moving from right to left

In the above figure, video frames were extracted from video sample 2 of subject 4. These video samples are stored in the folder “samples”. Each video sample is stored with the name “sample\_xx\_yy.AVI” , where

xx = subject\_id varying from 1 to 4

yy = sample-number varying from 1 to 26.

For yy <=13 subject is moving from right to left and for yy > 13 subject is moving from left to right.

For the above sample, value of xx = 4 and value of yy = 2 i.e. “sample\_4\_2”.

**1.3 Feature Extraction from Chosen Video Frames**

These video frames were analyzed from three different human experts for manual annotation and the average of the three was taken as absolute coordinates of coordinator (CN), left hand , right hand, left foot and right foot sensor nodes.

For example for Frame no. 71 coordinate values from three different experts is shown in Table 3.

Table 3 : Manual annotation of CN and sensor node positions

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Expert | CN | | Left hand | | Right hand | | Left foot | | Right foot | |
|  | x | y | x | y | x | y | x | y | x | y |
| 1 | 254 | 536 | 217 | 545 | 214 | 530 | 347 | 602 | 355 | 527 |
| 2 | 245 | 528 | 212 | 540 | 213 | 535 | 350 | 597 | 365 | 530 |
| 3 | 248 | 532 | 219 | 538 | 218 | 531 | 350 | 598 | 360 | 530 |
| Average  Taken as  Absolute coordinates | 249 | 532 | 216 | 541 | 215 | 532 | 349 | 599 | 360 | 529 |

The absolute coordinates corresponding to above extracted frames is shown in Table 4.

Table 4: Absolute coordinate positions of CN and sensor nodes for “sample\_4\_2”

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Frame No. | CN | | Left hand | | Right hand | | Left foot | | Right foot | |
|  |  | |  | |  | |  | |  | |
|  | x | y | X | y | x | y | x | y | x | y |
| 71 | 249 | 532 | 216 | 541 | 215 | 532 | 349 | 599 | 360 | 529 |
| 78 | 244 | 493 | 212 | 493 | 212 | 490 | 360 | 490 | 360 | 524 |
| 85 | 257 | 446 | 221 | 444 | 221 | 438 | 364 | 429 | 351 | 501 |
| 92 | 252 | 400 | 214 | 395 | 214 | 399 | 371 | 430 | 348 | 409 |
| 99 | 261 | 356 | 219 | 347 | 218 | 351 | 372 | 424 | 362 | 322 |
| 106 | 258 | 309 | 217 | 301 | 216 | 302 | 352 | 353 | 366 | 310 |
| 113 | 251 | 257 | 218 | 259 | 217 | 254 | 365 | 232 | 374 | 305 |
| 120 | 261 | 205 | 223 | 204 | 224 | 199 | 371 | 193 | 347 | 267 |
| 127 | 254 | 161 | 212 | 154 | 212 | 160 | 371 | 188 | 351 | 175 |
| 134 | 257 | 115 | 223 | 102 | 221 | 106 | 369 | 176 | 367 | 99 |
| 141 | 251 | 70 | 217 | 62 | 217 | 66 | 350 | 101 | 361 | 88 |

As camera used to shoot the videos was 2-D, we are assuming z-coordinate to be +70 and -70 as per the relative pixels. The coordinates (x,y,z) of each sensor node and CN are shown below in relation to above frames.

combine31-34.tif

combine35-38.tif

combine39-41.tif

Fig. 2 : Subject 4 with different node positions while moving from right to left corresponding to frames in Figure 1.

The coordinate positions of all sensor nodes including CN were changing each time when the subject was walking. We assume that distances between CN and sensor nodes are nothing to do with the displacement of the subject walking. Therefore, the relative coordinate positions of each sensor node about CN position are calculated using an offline application developed in Matlab for further performance evaluation. Coordinate positions of CN are taken as the origin. Extracted relative coordinates (features) with respect to CN are shown in Table 5.

Table 5 : Relative coordinate positions of sensor nodes about CN for “sample\_4\_2”

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Frame No. | Coordinator | | | Left hand | | | Right hand | | | Left foot | | | Right foot | | |
|  | x | y | z | x | y | z | x | y | z | x | y | z | X | y | Z |
| 71 | 0 | 0 | 0 | 33 | 9 | -70 | 34 | 0 | 70 | -100 | 67 | -70 | -111 | -3 | 70 |
| 78 | 0 | 0 | 0 | 32 | 0 | -70 | 32 | -3 | 70 | -116 | -3 | -70 | -116 | 31 | 70 |
| 85 | 0 | 0 | 0 | 36 | -2 | -70 | 36 | -8 | 70 | -107 | -17 | -70 | -94 | 55 | 70 |
| 92 | 0 | 0 | 0 | 38 | -5 | -70 | 38 | -1 | 70 | -119 | 30 | -70 | -96 | 9 | 70 |
| 99 | 0 | 0 | 0 | 42 | -9 | -70 | 43 | -5 | 70 | -111 | 68 | -70 | -101 | -34 | 70 |
| 106 | 0 | 0 | 0 | 41 | -8 | -70 | 42 | -7 | 70 | -94 | 44 | -70 | -108 | 1 | 70 |
| 113 | 0 | 0 | 0 | 33 | 2 | -70 | 34 | -3 | 70 | -114 | -25 | -70 | -123 | 48 | 70 |
| 120 | 0 | 0 | 0 | 38 | -1 | -70 | 37 | -6 | 70 | -110 | -12 | -70 | -86 | 62 | 70 |
| 127 | 0 | 0 | 0 | 42 | -7 | -70 | 42 | -1 | 70 | -117 | 27 | -70 | -97 | 14 | 70 |
| 134 | 0 | 0 | 0 | 34 | -13 | -70 | 36 | -9 | 70 | -112 | 61 | -70 | -110 | -16 | 70 |
| 141 | 0 | 0 | 0 | 34 | -8 | -70 | 34 | -4 | 70 | -99 | 31 | -70 | -110 | 18 | 70 |

In this way, features were extracted from all the 104 video samples to create input data set also called feature database. These extracted features are stored in folder “annotations”.