LIST OF FIGURES

1.1 Video Surveillance 3
1.2 Advanced human interface 3
1.3 Motion based diagnosis 3
1.4 Poses of a complete human walk action 8
1.5 Phases of human gait analysis 8
2.1 JDL data fusion framework 15
2.2 Dasarathy’s Input-Output model 17
2.3 Demonstration of classification based on abstraction levels 18
2.4 Outline of general human movement analysis 21
3.1 Proposed Tri-level Unified Framework 42
3.2 Proposed sequence of tasks analysis of human gaits 44
3.3 Overview of the proposed research work 47
4.1 Sample frames of Weizmann dataset 51
4.2 Sample frames of i3DPost Multi-view Human action dataset 52
4.3 (a) A frame from Weizmann dataset video sequence of jumping type of gait, 55
(b) With adaptive background, (c) Binarized difference image
4.4 (a) A frame from Weizmann video dataset sequence of bending type of gait, 56
(b) With adaptive background, (c) Binarized difference image
4.5 (a) A frame from i3DPost Multi-view Human action dataset video sequence 57
of walking type of gait, (b) With adaptive background, (c) Binarized difference image
4.6 (a) A frame from i3DPost Multi-view Human action dataset video sequence 58
of falling type of gait, (b) With adaptive background, (c) Binarized difference image
4.7 Human present in RGB frame 60
4.8 Human present in HSV frame 60
4.9 (a), (b), (c) - Decomposition of human present frame into Hue, Saturation, 60
Value Layers
4.10 Extracted frames of Human Silhouettes from Weizmann data using Simple background modeling on ‘V’ layer in HSV color space followed by morphological operation

4.11 Original Frame from the video

4.12 Extracted Silhouette from the video frame

4.13 Extraction and tracking human during falling

4.14 Tracking human during sitting

4.15 Tracking human during jumping

4.16 Sequence of walking using BGMM

4.17 Sequence of jumping using BGMM

4.18 Sequence of bending using BGMM

4.19 Sequence of running using BGMM

4.20 Sequence of walking using RBGMM

4.21 Sequence of jumping using RBGMM

4.22 Sequence of Bending using RBGMM

4.23 Sequence of Running using RBGMM

4.24 Processing time comparison for walking

4.25 Processing time comparison for bending

4.26 Processing time comparison for running

4.27 Processing time comparison for jumping

5.1 Selected silhouettes represented in a single dimension vector

5.2 Extraction of boundary points using radii and angular distance along the outer contour points of the silhouettes

5.3 Original video sequence from Weizmann data set illustrating a running scene

5.4 Motion Elements using BGMM method

5.5 Motion elements using Recurrent block wise GMM (RBGMM) method

5.6 Data overhead comparison

5.7 Time complexity comparison

5.8 Original video sequence from Weizmann data set illustrating a walking scene

5.9 Predicted Motion Elements using BGMM

5.10 Estimated Motion elements based on proposed Recurrent block wise GMM (RBGMM) coding

5.11 Data overhead comparison
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.12</td>
<td>Time complexity comparison</td>
<td>82</td>
</tr>
<tr>
<td>5.13</td>
<td>HOG and PbHOG features of human silhouettes</td>
<td>87</td>
</tr>
<tr>
<td>5.14</td>
<td>Size of reduced Optimized feature set using integration of PbHOG and 2D-SIFT</td>
<td>89</td>
</tr>
<tr>
<td>6.1</td>
<td>Basic Neural network</td>
<td>93</td>
</tr>
<tr>
<td>6.2</td>
<td>Representation of the hyper plane in SVM</td>
<td>95</td>
</tr>
<tr>
<td>6.3</td>
<td>Gait action classification process using multiclass SVM</td>
<td>96</td>
</tr>
<tr>
<td>6.4</td>
<td>Classification of actions using SVM Classifier a) Walking b) Running c) Sitting d) Dancing</td>
<td>98</td>
</tr>
<tr>
<td>6.5</td>
<td>Classification accuracy using SVM classifier</td>
<td>98</td>
</tr>
<tr>
<td>6.6</td>
<td>Classes of human action taken for experimentation</td>
<td>99</td>
</tr>
<tr>
<td>6.7</td>
<td>(a) Query of walking sequence (b) Predicted gait using multiclass linear SVM</td>
<td>100</td>
</tr>
<tr>
<td>6.8</td>
<td>(a) Query of bending sequence (b) Predicted gait using multiclass linear SVM</td>
<td>101</td>
</tr>
<tr>
<td>6.9</td>
<td>(a) Query of jumping sequence (b) Predicted gait using multiclass linear SVM</td>
<td>101</td>
</tr>
<tr>
<td>6.10</td>
<td>Precision and Recall values of different methods used for experimentation</td>
<td>103</td>
</tr>
<tr>
<td>6.11</td>
<td>Graph of Precision values in percentage using various methods</td>
<td>104</td>
</tr>
<tr>
<td>6.12</td>
<td>Graph for Accuracy values in percentage of various methods</td>
<td>105</td>
</tr>
<tr>
<td>6.13</td>
<td>Graph for Recall values of various methods</td>
<td>106</td>
</tr>
<tr>
<td>6.14</td>
<td>(a) Snapshot of normal gait of a walking person in video sequence 1 (b) Snapshot of falling - transition of gait from walking to falling in video sequence 1</td>
<td>109</td>
</tr>
<tr>
<td>6.15</td>
<td>(a) Snapshot of normal gait of a person walking in video sequence 2 (b) Snapshot of sitting - transition of a normal gait from walking to sitting in video sequence 2</td>
<td>109</td>
</tr>
<tr>
<td>6.16</td>
<td>(a) Snapshot of normal gait of a person running in video sequence 3 (b) Snapshot of walking - transition of a normal gait from running to walking of a person in video sequence 3</td>
<td>110</td>
</tr>
</tbody>
</table>