Motion Cues Analysis for Parkinson Gait Recognition

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Background
Previous assessment methods for Parkinsonian Gait (PG) recognition used sensor mechanisms for PG that may cause discomfort. In order to avoid stress of applying wearable sensors, computer vision (CV) based diagnostic systems for PG recognition have been proposed. Main constraints in these methods are the laboratory setup procedures. Novel colored dresses for the patients were specifically designed to segment the test body from a specific colored background [1-3].

Objective
To develop an image processing tool for home-assessment of Parkinsonian Gait by analyzing motion cues (i.e. stride and lean frequencies) extracted during the gait cycles.

Methods
The system is based on the idea that a normal body attains equilibrium during the gait by aligning the body posture with the axis of gravity. Due to the rigidity in muscular tone, persons with Parkinson’s disease (PD) fail to align their bodies with the axis of gravity. The leaned posture of PD patients appears to fall forward [4]. Whereas a normal posture exhibits a constant erect posture throughout the gait. Patients with PD walk with shortened stride angle (less than 15 degrees on average) between the legs with high variability in the stride frequency. Whereas a normal gait exhibits a constant stride frequency with an average stride angle of 45 degrees between the legs [5]. In order to analyze PG, levodopa-responsive patients and normal controls were videotaped with several gait cycles. First, the test body is segmented in each frame of the gait video based on the pixel contrast from the background to form a silhouette. Next, the centre of gravity controls were videotaped with several gait cycles. The system is based on the idea that a normal body attains equilibrium during the gait by aligning the body posture with the axis of gravity. Due to the rigidity in muscular tone, persons with Parkinson’s disease (PD) fail to align their bodies with the axis of gravity. The leaned posture of PD patients appears to fall forward. The leaned posture of PD patients appears to fall forward. The leaned posture of PD patients appears to fall forward.

Results
High cosine dissimilarity was observed in the stride and lean frequencies between PG and normal gait as depicted in figure 2 and 3 respectively. High variations are found in the stride intervals of PG whereas constant stride intervals are found in the normal gait.

Conclusions
We propose an algorithm as a source to eliminate laboratory constraints and discomfort during PG analysis. Installing this tool in a home computer with a webcam allows assessment of gait in the home environment.

References