Distance measurement with step counting on Android platform

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Project Goal:

The goal of this project is to develop an Android app that can measure the distance by counting the steps a subject takes to move between two locations. The measurement can be taken by a single user or with the help of a second user. In the single user case, the user needs to place the phone at a proper location that can cover the whole measuring range. The user then video takes him/her walk/run between two end points. In the two user modes, a second user can do the video taking while the first one moves between two end points. The video is then processed and analyzed to count the number of steps that it takes for the subject to move from point A to point B, based on which, the distance is calculated. In order to find the correct mapping between the number of steps and the distance, a priori training procedure is needed. In this training step, the user needs to walk/run in a known distance and the app can count the number of steps and figure out the mapping.

The fundamental assumption in this app is that the lengths of steps for a specific person in a specific speed range are roughly the same. If the user measures by running, then s/he needs to do the training by running too. The training result is only valid for that person. That means for a different person, s/he needs to redo the training.

The image processing task in this project is to properly count the distinct steps. We can assume the camera frame rate is high enough so no steps will be missed. The processing and analysis include image segmentation, properties study and utilization or the motion recognition etc. The exact implementation will need more time to think through.

The implementation will be done in the client-server cloud computing fashion. The client is an Android tablet. The plan is to use the tablet as a video taking tool and upload the video to the Matlab server for processing and analysis. The result will be sent back to the tablet. This scheme is chosen to ensure the development can be done in the limit time.

Reference:

[1] M.Bichsel, "Segmenting Simply Connected Moving Objects in a Static Scene," Trans. Pattern Analysis and Machine Intelligence, vol. 16, no. 11, pp. 1,138—1,142, Nov. 1994

[2] K.Rohr, "Towards Model-Based Recognition of Human Movements in Image Sequences," CVGIP:Image Understanding, vol.59, no.1,pp.94—115, Jan.1994

[3] Chin-Chun Chang; Wen-Hsiang Tsai; , "Vision-based tracking and interpretation of human leg movement for virtual reality applications," Circuits and Systems for Video Technology, IEEE Transactions on , vol.11, no.1, pp.9-24, Jan 2001