Joint Angle Measurement in Yoga using IMUs

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There are many human activities in which success depends on the correct coordination and control of body movement. Exercises such as yoga can benefit from real-time feedback on the motion of the body segments. This preliminary study shows that inertial measurement units (IMUs) can be used as a tool for providing real-time or end of session feedback about specific activities. Such information may help to improve the learning speed and quality of a yoga training session. A motion capture system consisting of 17 IMUs distributed over different body segments was used to capture the body kinematics. The IMUs fit in a suit which fits comfortably on the subjects and minimally interferes with the study exercises.

A template for the acceptable form of six different yoga poses was created using the pose recommendations from an instructional manual. Subjects were given general instructions on how to make the poses and their performance on certain metrics was compared to that of an instructor. In the figure, the performance of a group of 10 subjects (7M, 3F) doing a half-wheel yoga pose was compared to that of an instructor (F). It shows that for the first metric -“Do not bend elbow”, the group mean was 20 deg. higher than that of the instructor even though the instructor also deviated from the ideal (0 deg.) by about 11 deg. It also shows that the instructor was steadier in the pose than the average group performance as the standard deviation of her lateral bend angle metric is about 0.5 deg. lower than the group mean. In conclusion, we show that the IMU system can distinguish between the performance of an instructor and novices. The system, along with its graphical avatar, can be used to improve the quality of the exercise.

