

# AUTOMATIC SYSTEM FOR 3D CAMERA (KINECT) JOINT RANGE OF MOTION EVALUATION OF PHYSICAL FITNESS

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## Abstract

In this project, we proposed to developed automatic systems for 3D camera (Kinect technology) joint range of motion evaluation of physical fitness. At present, There are many ways to evaluation of physical fitness. One of them is call range of motion. This is the linear or angular distance that a moving object may normally travel while properly attached to another using tool is named goniometers. The paper a system develops by using body movement postures defined in the analysis to measure joint angle instead of goniometer by using a microsoft kinect technology. This work can help the researcher to capture the motion and analyze the data for rehabilitation and weight training.

## Motivation

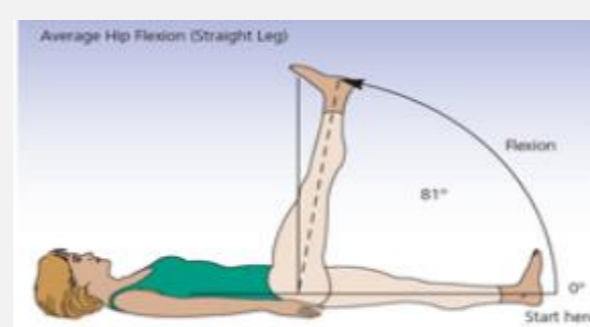
- Physical therapist may use a goniometer to obtain a baseline range of motion measurement around a specific joint.
- Reduce the number of Physical Appraisers.
- Physiotherapists can measure angles without using goniometer.

## Objective

We propose developed automatic systems by using body movement postures defined in the analysis to measure joint angle instead of goniometer by using a microsoft kinect

## Selection

Because of the range of motion, there are many different types. We choose the Kinect camera can work. These include: Hip flexion , Hip extension , Knee flexion , Shoulder flexion , Elbow flexion



Hip flexion



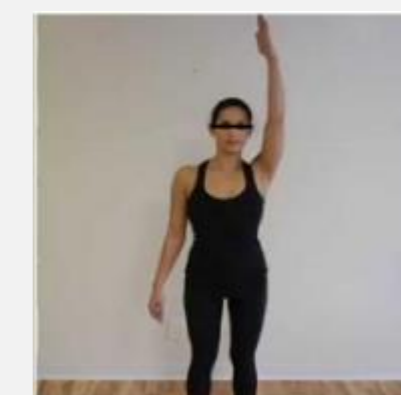
Knee flexion



Elbow flexion



Hip extension



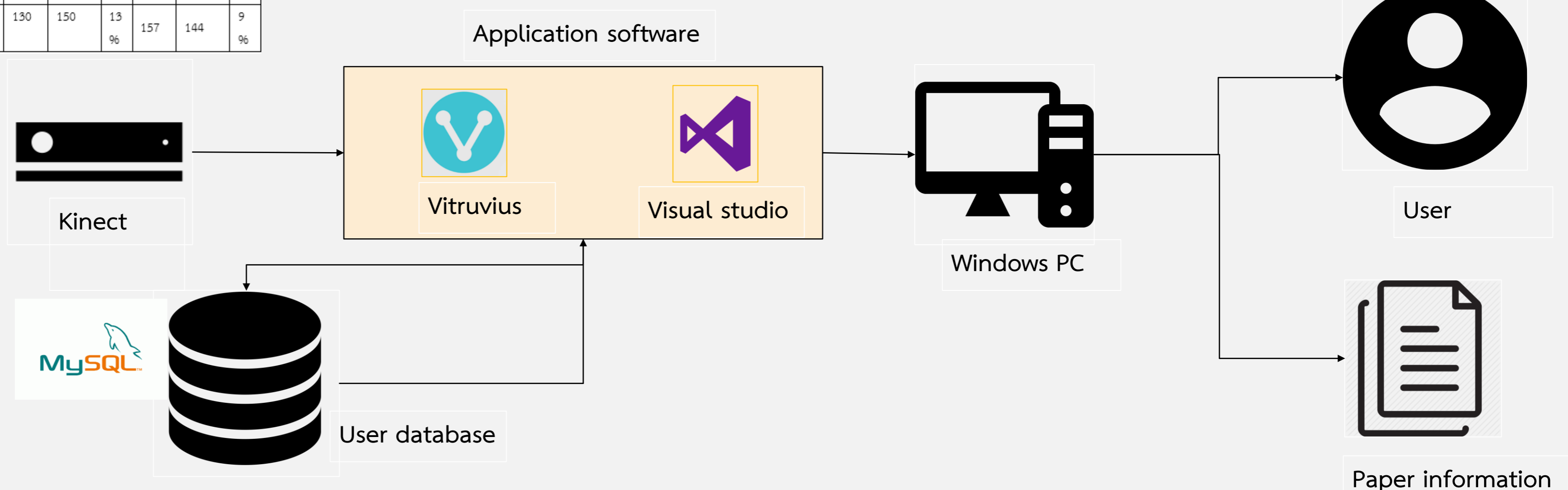
Shoulder flexion

## Results

No	Hip flexion			Hip extension			Knee flexion			Shoulder flexion			Elbow flexion		
	software	gonio meter	error	software	gonio meter	error	software	gonio meter	error	software	gonio meter	error	software	gonio meter	error
1	149.66	123.33	21%	11.66	17.33	32%	136.66	130	5%	135.33	162.33	16%	151.66	139.66	8%
2	148.33	145	2%	13	13	0%	153.66	136	12%	132	148.33	11%	162.33	151.33	7%
3	130	131.66	1%	22.33	20	11%	136	130	4%	120	150	20%	156	148	5%
4	127	130.33	2%	7.33	9.33	21%	141	133	6%	130	150	13%	163	138	18%
5	140	132	6%	13.66	15	9%	140.66	131.66	6%	131.66	143.33	8%	155	147.33	5%
summary	139	132	5%	13	14	0%	141	132	6%	130	150	13%	157	144	9%

There are 5 people between 20-25 years old. A total of 5 tests were performed. The program was measured three times and three times.

## System Architecture



## References

- Physical therapy. 2018 4/February/2018 [cited 2018 7]; Available from: <https://goo.gl/WT8nK8>.
- Euclidean Distance. 2017 30 November 2017 [cited 2017]; Available: [https://en.wikipedia.org/wiki/Euclidean\\_distance](https://en.wikipedia.org/wiki/Euclidean_distance).
- Range of motion. 2017; Available: [https://en.wikipedia.org/wiki/Range\\_of\\_motion](https://en.wikipedia.org/wiki/Range_of_motion).
- Normal Joint Range of Motion Study. 29 November 2010 [cited 2017 December]; Available: <https://www.cdc.gov/ncbddd/jointrom/>.
- Yootana Booranrom, D.P.M., Dr. Bunthit Watanapa, Smart Bedroom Prototype for the Elderly using Kinect Camera Motion Captures. 2014, King Mongkut's University of Technology Thonburi.
- Somying Thainimit, o.T., Pornchai Jullamate, Kinect- based Exercise Coaching for Elderly. 2016, Kasetsart University.
- palinyawan, p., Office Workers Syndrome Monitoring Using Kinect. 2014, King Mongkut's University of Technology Thonburi.
- Hossein Mousavi Hondori, M.K., A Review on Technical and Clinical Impact of Microsoft Kinect on Physical Therapy and Rehabilitation. 2014, School of Medicine, University of California.