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# Automatic Digital Biometry Analysis System

## ABSTRACT

*The body posture evaluation of a subject manifests, in different degrees, his level of physicanatomical health given the behavior of bone structures, and especially of the dorsal spine. For instance, common musculoskeletal dysfunctions or disorders (MSDs) such as scoliosis, kyphosis, lordosis, arthropathy, or spinal pain show some of their symptoms through body posture. This requires the use of reliable, non-invasive, automatic, and easy to use tools for supporting diagnostic. It is proposed a* ***semi-automatic novel tool for posture and spinal analysis estimation based on the analysis of 3D information from depth maps using the Kinect device. The system is able to automatically analyze postural abnormalities in order to support diagnostic and track the evolution in rehabilitation treatments.***

## 1. Requeriments

### Motivation

• World Health Organization has categorized musculoskeletal disorders as the main cause for absence from occupational work, leading to considerable costs for public health systems.

• Posture abnormalities represent a risk factor for musculoskeletal disorders.

•It is necessary a set of tools to obtain an accurate body posture analysis, reliable, and cheap.

## 2. Framework

### Technique

• It is presented a novel semi-automatic system that uses RGB-Depth information for clinical postural analysis.

• Given a set of keypoints defined by the user, and accurate measurements are computed.

• The output obtained allows us to monitore the evolution of the patient.

### Principal Strengths

• **Accurate** and **reliable** results.

• **Non-invasive**.

• **Easy installation** on a wide variety of scenarios and settings.

• **Customizable** to the needs of the therapist.

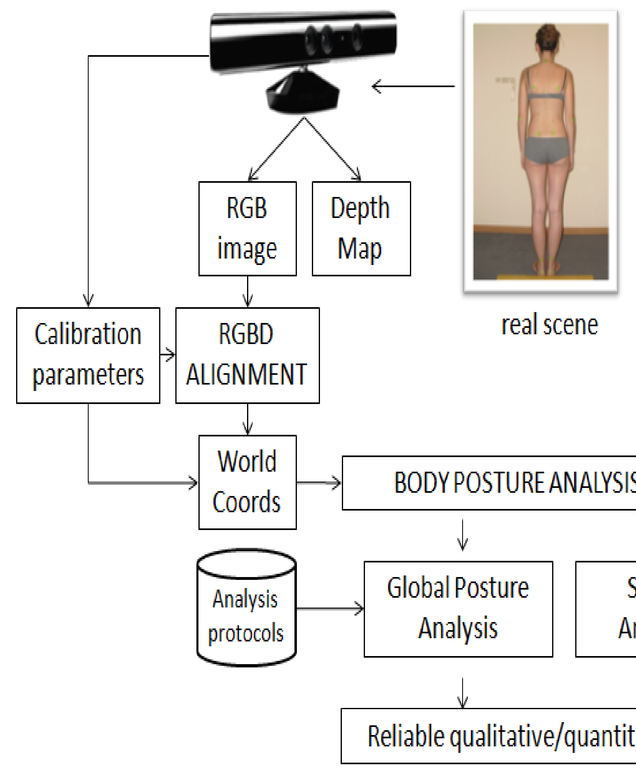
• Allows **automatic** complex analysis **quickly**.

• **3D** visualization environment.

• Efficient control of **evolution**.

• **Low cost** system.

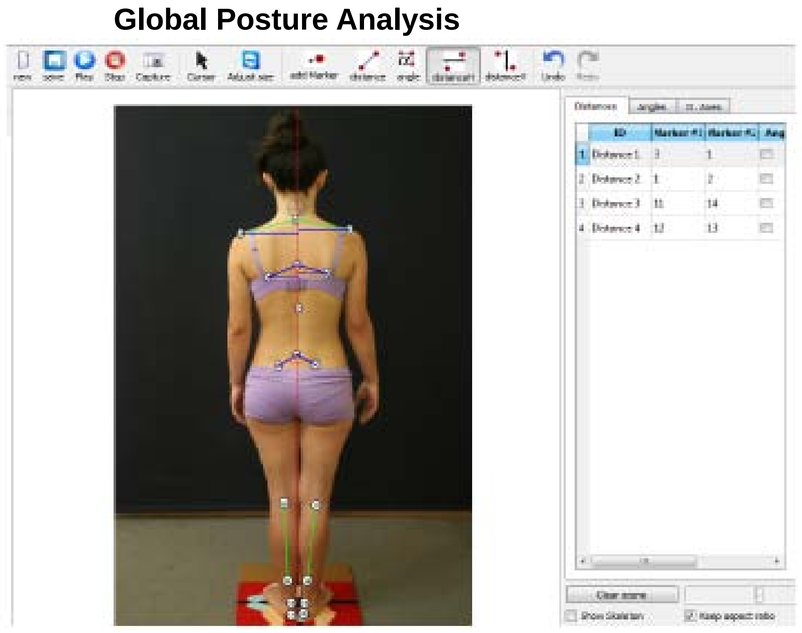
### System Overview




## 3. Software and Results

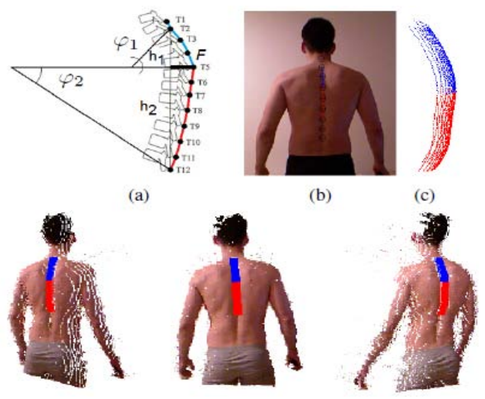
### Global Posture Analysis

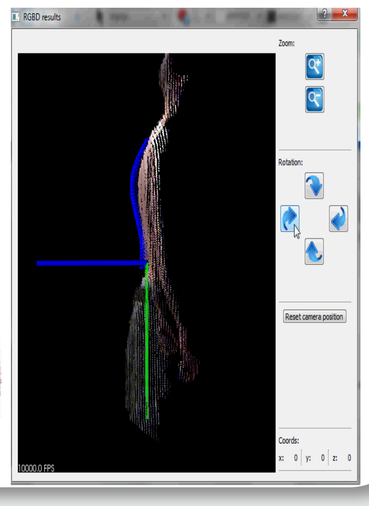
•This module computes and associates a set of three-dimensional angles and distances to keypoints defined by the customizable protocol designed by the user.



### Spinal Analysis

• It evaluates sagittal spine curvatures by non-invasive graphic estimations in kyphosis and lordosis patients [1].



### Quantitative results

| Distance subject-device (m) | 1,3 | 1,9 | 2,2 |
|---|---|---|---|
| AAV (mm) | 3,2 | 4,8 | 6,2 |
| AAV (o angles) | 1,98 | 1,42 | 2,1 |
| AAV (%) | 0,46 | 0,77 | 1,3 |
| Standard Error (%) | 1,01 | 1,18 | 1,71 |

• A battery of 500 simple tests has been labeled by three different observers,
• 99% intra class correlation coefficient up to for all planes (X,Y,Z).

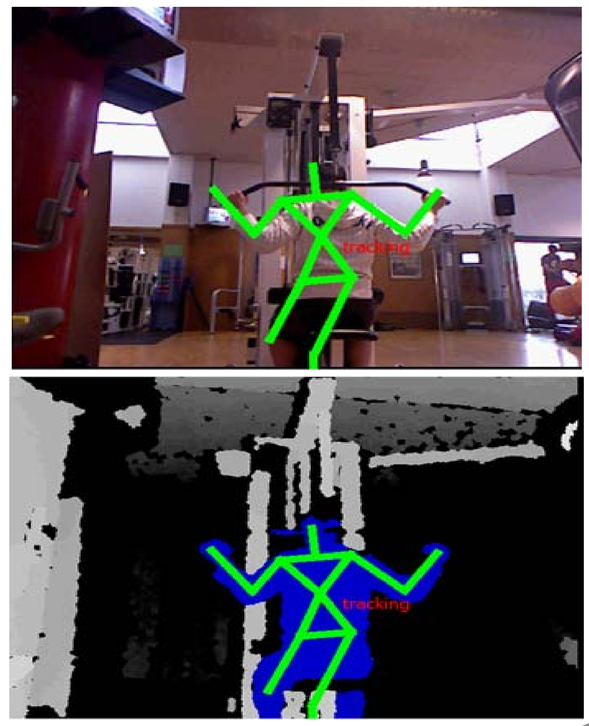
## 4. Next step: Dynamic Analysis

### Future Work

• Within the field of physiotherapy and rehabilitation therapy there is a need to develop a reliable and accurate assessment of dynamic body posture**.**

• Our idea is focused on developing a reliable and accurate system to validate the achievement of a rehabilitation or fitness exercise, providing the necessary biofeedback to assess postural correction, rehabilitation, and fitness condition.

• Applications: **autonomous and automatic examination and evolution analysis in rehabilitation, ehealth, telecare, and fitness condition.**




## References

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