Maestría en Ingeniería en Sistemas y Computo Inteligente

Title

Imitation of human body motion on a humanoid robot using a motion capture device

Author

David López Bárcenas

Contributor

Antonio Benítez

September-December 2015

Imitation of Human Body Motion on a Humanoid Robot Using a Motion Capture Device

David López, Antonio Benitez
Maestría en Sistemas y Cómputo Inteligente
{david.lopez, antonio.benitez}@uppuebla.edu.mx
Tercer Carril del Ejido Serrano S/N, San Mateo Cuanalá, Juan C. Bonilla, Puebla, México

1. Introduction

Interaction between robots and human beings was a condition that should be avoided because the risk associated to machine usage and the minimum advances in security, nowadays interaction is a "must have" due to inclusion of these system in daily life.

Robots that are used in human environments must know and try to imitate motions such as those used in their works when done by humans.

For this purpose diverse applications have been developed, in most cases using lots of recourses in hardware, software with their respective high economic investment.

2. Objectives

2.1. General objective

To imitate human motion with a bipedal robot using a motion capture device.

2.2. Particular objective

- To determinate a finite set of positions that the robot may identify.
- To identify settings to be sent to the robot via Kinect motion capture device
- To implement algorithms that guide the robot to desired configuration.
- To simulate the process in a virtual environment.

3. Method

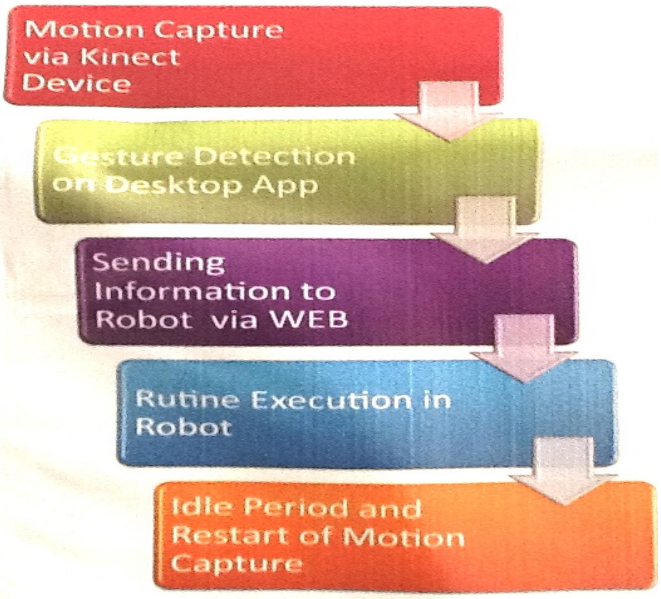

Figure1. Methodology used in this research

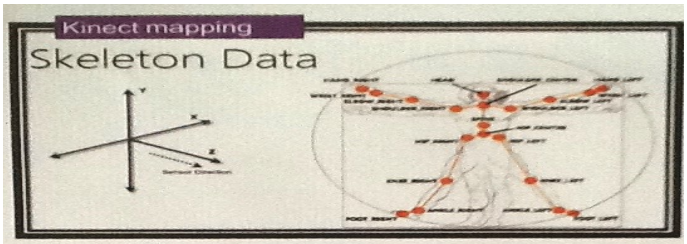

Figure 2. Kinect Sensor translates human motion to 3D coordinates for a set of human joints, this must be processed in order to identify positions.

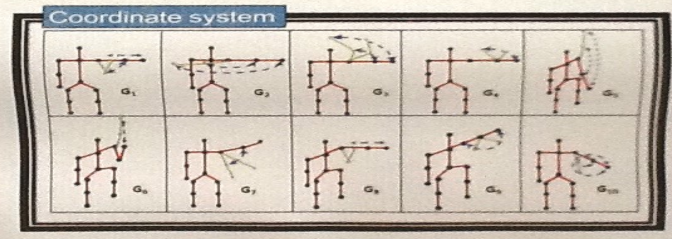

Figure 3. In order to detect positions a Desktop App Kinect uses to process the data using Gesture Recognition saved on a template.

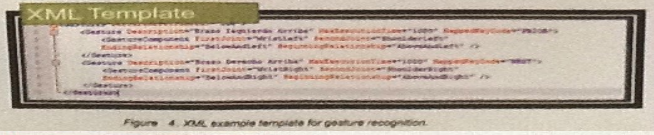

Figure 4. XML example template for gesture recognition.

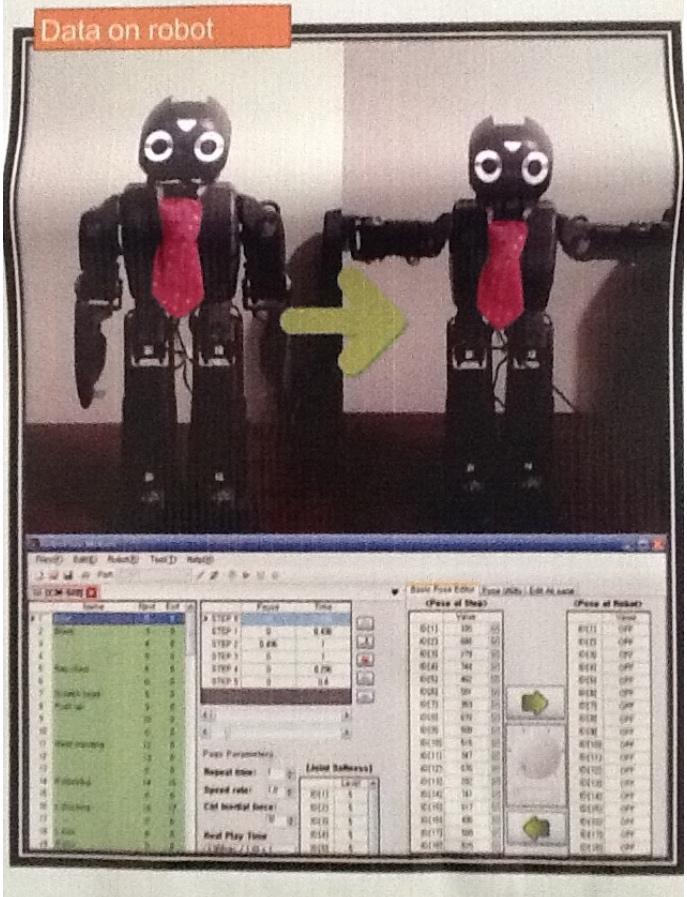

Figure 5. Rehabilitation routine steps saved in robot using RoboPlus Motion

4. Results

To obtain experimental results, a system capable of movement recognition using Kinect and a Desktop App written in C# has been designed.

When it identifies a routine defined to be represented in the robot, a command is sent via WEB for its execution.

For this means a set of Works has been done previously the implementation, some of them are listed below:

- Analysis of rehabilitation routines for improvement in muscle tone that may be done standing in one or both feet.
- Description and representation of those routines in the robot.
- Codification of those routines in the XML template.
- All this had led to a first system capable of imitating some human motions on a humanoid robot.

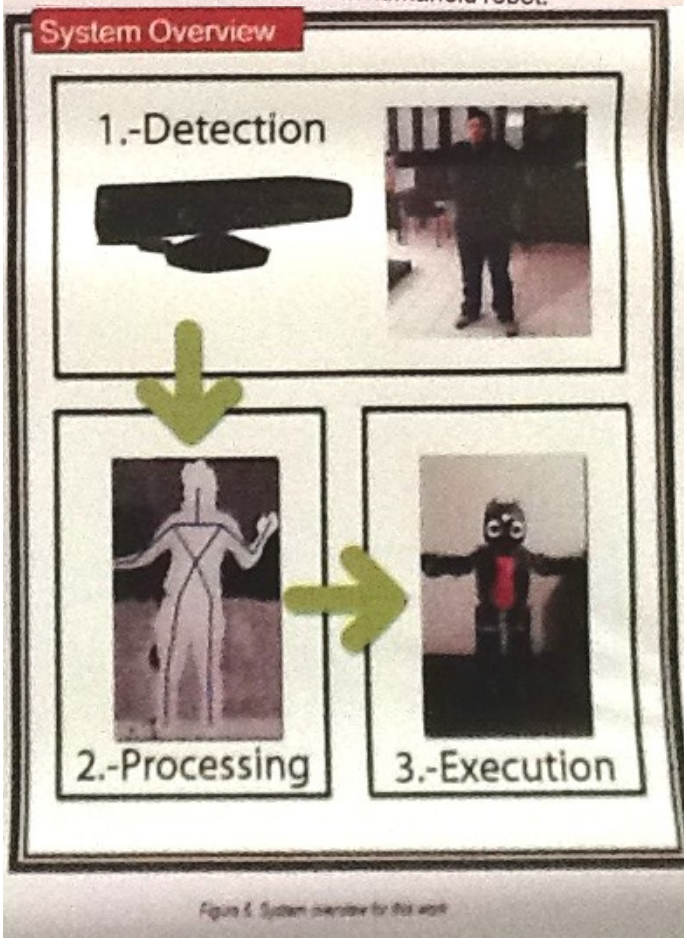

Figure 6. System overview for this work

5. Conclusion

In order to achieve the particular objectives there are the next advances:

- The set of positions to be identified by the robot, has been set to 10 using information on rehabilitation routines.
- Identification of settings is done using templates for gesture recognition, the algorithm used is based on relative positions for joints over time.
- The process will be simulated on Gazebo system, due to its wide advantages on resources and interaction with Kinect device.

Acknowledgements

To Laboratorio de Investigación de Posgrado at Universidad Politécnica de Puebla

2015