

## Wearable Body Motion Sensor

### Motivation

Highly articulated biomechatronic systems, such as humanoid robots, exo-skeletons, and medical assistive devices, are gaining popularity in recent years because of their potential applications in human-centered environment for health care, service, security, and entertainment purposes. Since the mechanical structures of these systems possess very large number of degrees of freedom, the motion generation and control of these biomimetic systems are very complex. The common challenges are in re-producing movements of their counterparts in the real world and in synthesizing new coordinated movements. In this project, we intend to develop a new type of wearable motion capture system that is lightweight, real-time, robust in data acquisition, free from electromagnetic interference, and low cost.

### Objective

To design and develop a high performance wearable and non-obtrusive human anatomical motion sensing device capable of capturing and converting the motion data in real time.

### Scope

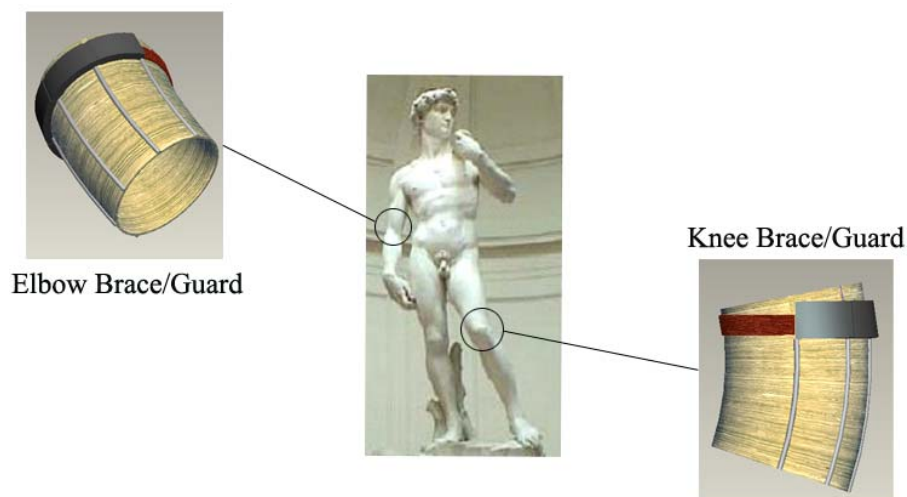
A full-body wearable motion "suit" will be developed to capture the complete body movements. The 'suit' will have multiple motion sensors, embedded data processing units for motion fusion, and wireless communication and network unit. The human motion 'suit' can be used for the real-time control and manipulation of virtual human figures in interactive media, and highly articulated physical biomechatronic systems, such as humanoid robots, exo-skeletons, and medical assistive devices. The major challenges of the project are in the development of an embedded sensing technique and a device with long wearability and ergonomics, as well as the real-time data processing and motion control of virtual and physical entities.

### Innovative Ideas

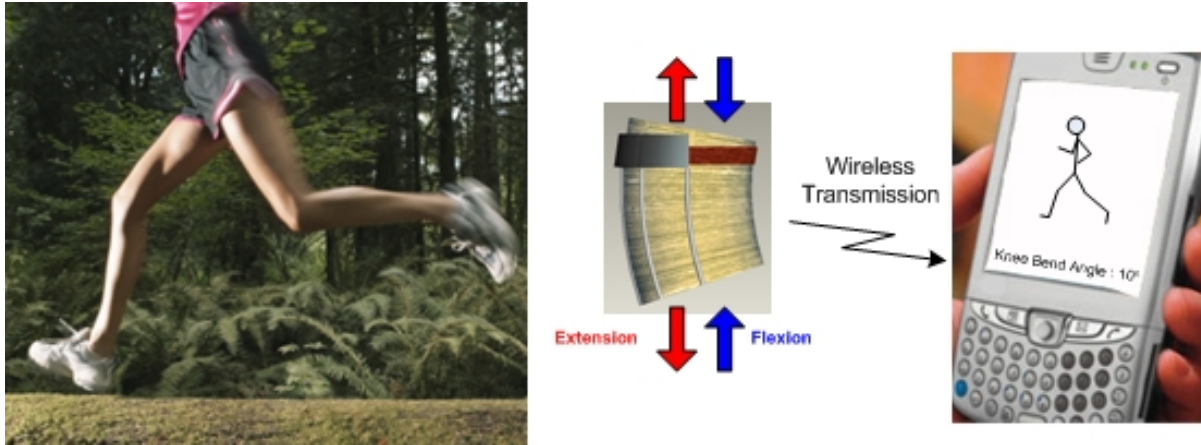
By focusing on our effort to streamline the use of laser and optical sensor packaged in an unobtrusive manner, we will be able to acquire the maximum amount of data for body motion processing using the minimum number of sensors by means of smart positioning.

### Demonstrable Activities

Our goal for the "Wearable Body Motion Sensors" project is to have the sensors in the form of stretchable braces/guards which allows users to strap on directly into the joints where motion data is to be captured. Users can simply put the sensors on like a piece of garment and it will register the motion via a dynamically self-registering and wireless system.



**Figure 1.** Proposed Design of Elbow/Knee Brace for Motion Sensing



**Figure 2.** Application of Wearable Body Motion Sensor with Wireless System

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