

# Ergonomic Portable Measuring System Designed to Assist Patients with Metacarpal Injuries

## Abstract

Metacarpal injuries are a very widespread cause of consultations in emergency hospitals and are related to several types of injuries as well as, partial loss of mobility due to traffic, work or home accidents. After medical treatment, a rehabilitation phase is necessary to allow the patient to gradually recover mobility in the affected limb. This paper presents an alternative portable measurement system with an ergonomic glove designed from the anthropometry of the human arm, considering the movements and angles of the wrist, whose main objective is to enable the patient can achieve complete mobility of the fractured or injured joint. This ergonomic device allows a physiotherapist to constantly monitor the patient's evolution. In addition, interactive tools can be applied simultaneously within the development of the therapy. For the characterization of the measurement system it was necessary to acquire data from the extremities of the hand (radial tilt angle in the frontal plane, palmar tilt angle of the distal radius and carpal angles). These variables are recorded from an integrated system, which consists of an IMU (Inertial Measurement Unit) and a flex sensor. The implemented system, in addition to the sensor instrumentation, is able to plot and record data to be later interconnected through the implementation of Bluetooth and Wi-Fi modules to send the data to a web platform. Compared to existing devices, the ergonomic glove has the potential to increase user freedom and independence through its portable carry-belt package and palm open design.