

A SYSTEM TO EVALUATE THE MEASUREMENTS OF THE PLANTAR PRESSURES, AN APPROACH TO THE MATHEMATICAL MODEL

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Abstract. Gait analysis a useful diagnostic tool that is getting more and more used to guide the treatment of patients with gait disorders. One of the main issues in children under 10 years is related with the diseases of the soles. the most known is the flat feet, which in most of the cases parents do not get aware of existence of this problem until school age.

The main objective of this research work is to implement a system that assess and quantify the measurements of the different pressures in the soles, to evaluate the pressures in static pattern and dynamic as well.

The system is made up of three parts: the first one a module to evaluate the weight forces over each lower limb, the second one is a module to measure the sole pressures in static mode, and the third one is a module to evaluate the pressure sole pressures in dynamic mode, the system will quantify the weight forces over the lower limbs and will make relationships between them and the pressures in the soles both in static and dynamic ways.

This research work is intended to help orthopaedics and trauma doctors as well as physical therapists and rehabilitation workers in the prevention and diagnosis of foot disease by using sectorized images of the soles.

1 INTRODUCTION

The gait analysis is a diagnostic tool increasingly used in the treatment of patients with diseases related to trauma, amputations, and other neurological disorders, which will be analyzed for the sole purpose of improving the quality of care ensuring better results in rehabilitation treatments.

The foot is an inseparable part of the support function, proportion and antigravity support of the human system. For this reason its study and understanding are essential to ensure the health of the people.

Plantar pressures static.- In bipodal support the body weight is transmitted over both legs reaching each foot 50% of their total value. The first bone of the foot, astragalus, whose mission is to distribute this force to support their points. Static foot has two triangles, one back or support that goes from the heel to the metatarsal heads, and other prior or propulsion which comprises the metatarsals and toes.

Plantar pressures during the March.- There are many studies on the distribution of pressure during walking, which have very different values. This probably occurs by different methods and techniques used in each. In general, it is described that the weight hits the ground during walking is not uniform but varies drawing waves with two pressure peaks; match one heel contact and the other takeoff.

To describe the pressures generated in the foot during walking, normally the authors divided the foot considering biomechanical areas of greatest interest. It is generally accepted that the maximum local pressure of the entire foot is recorded in the heel and this occurs during the initial contact with the ground

2 THE PROPOSED METHOD

The proposed method is to put a template with pressure sensors to measure the force exerted on the fly. Materials are illustrated below.

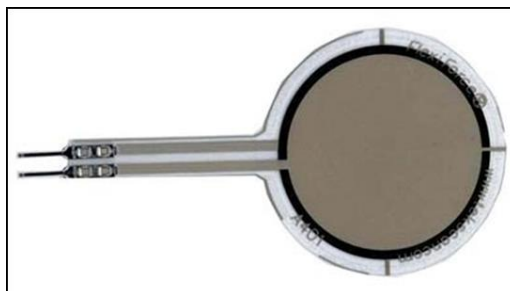


Figure 1: Sensor tekscan A401

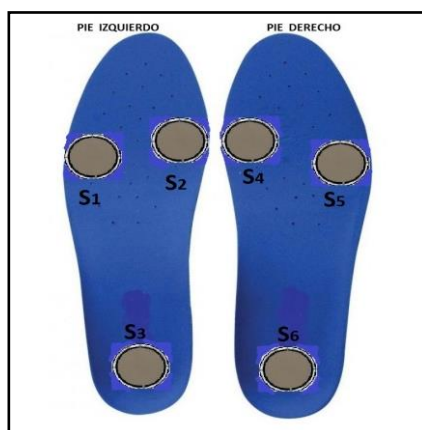


Figure 2: Position Sensors

3 FIRST RESULTS

Initiating the investigation set out to develop templates with 2 sensors FlexiForce, and we took the pressure reference plant is divided into two stages, 50% of pressure on the heel and the other 50% in the forefoot.

This theory was ruled out through consultation with specialists for that reason the implementation of templates with 3 sensors FlexiForce developed, since it is assumed that the pressure is distributed throughout the foot, also known as pressure is exerted on the heel, the first and fifth metatarsal.

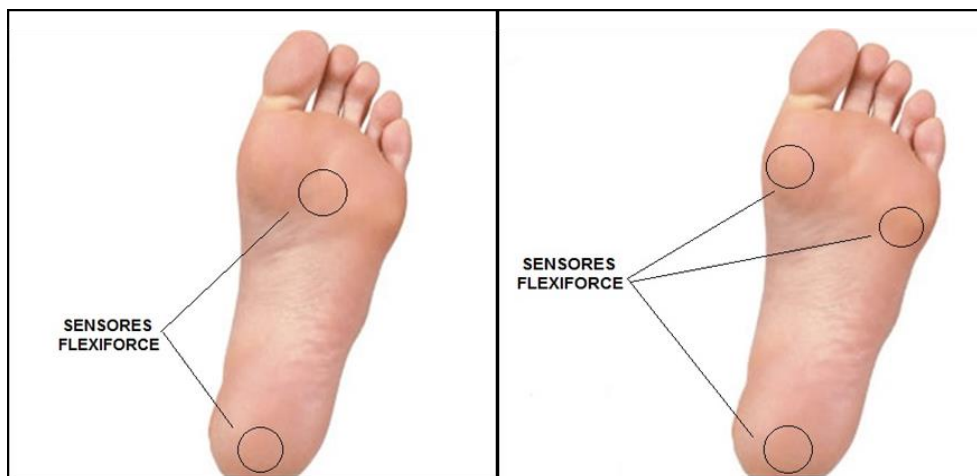


Figure 3: Position Anatomical Sensors

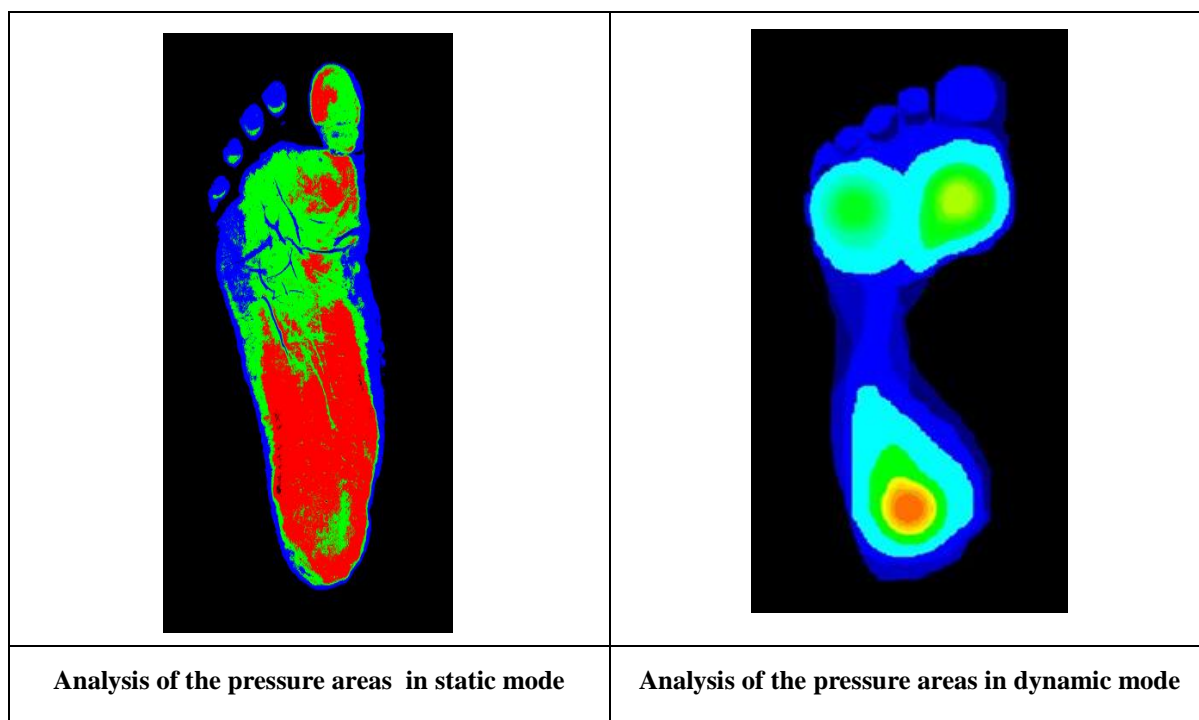
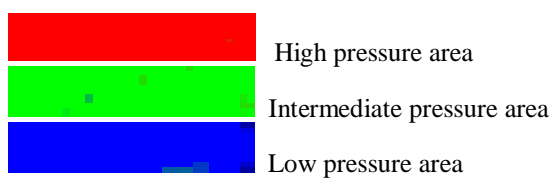


Figure 4: Comparison between static and dynamic pressure



4 CONCLUSIONS

Upon completion of this investigation was concluded that the results obtained by templates pressure, provides more information on the behavior of the foot at the time of contact with the ground in the course of the march, this information helps to physician in the diagnosis of the patient, since the records obtained in the course of the march demonstrate how the patient presses in dynamic mode.

The results of the 03 sensors will be evaluated by the treating physicians, as they show us that sensor has more pressure and few Kg-f were subjected, as shown in Figure 2, this result indicates the party has more support in the sole, as this result may follow a rehabilitation treatment or add custom templates thanks to the information obtained.

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