18. SENSING-ACTUATING ROBOTICS

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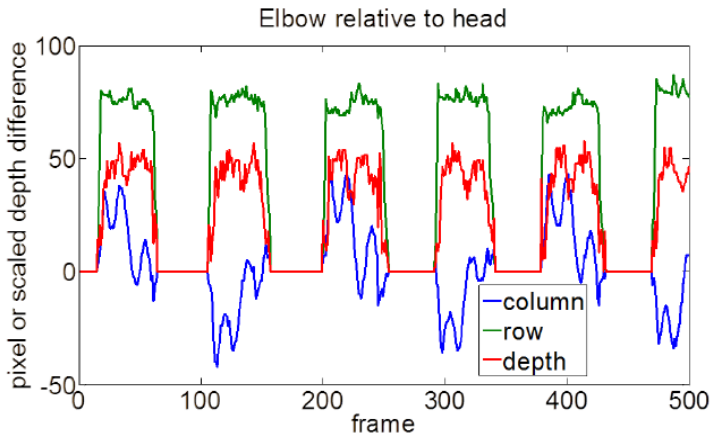
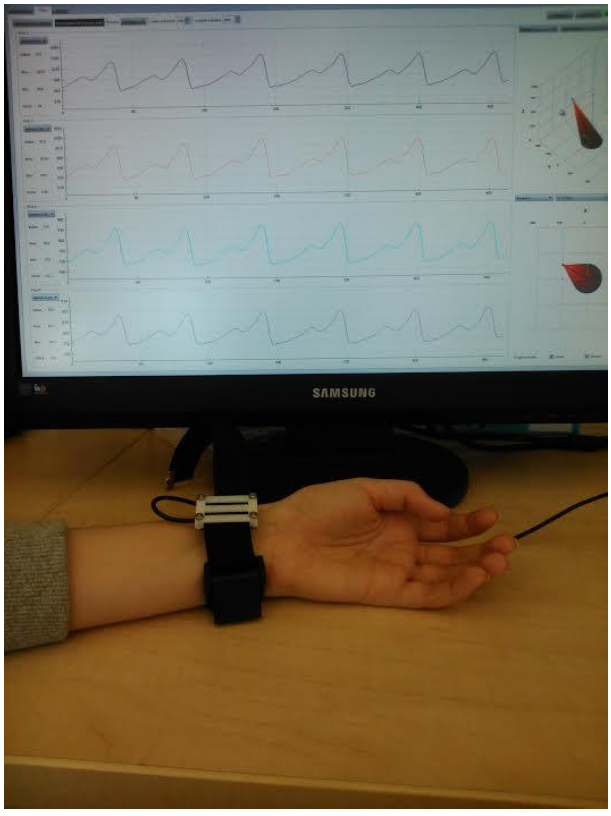
LATEST RESULTS

Nonintrusive human recognition techniques promise the ability to distinguish people by their biological traits without their active participation. The technique pursued in this research is gait recognition, identifying someone by the unique way he or she walks. This is of natural interest in security applications, but other endeavors also stand to benefit from increased access to information about gait. Examples of these include walking rehabilitation and shoe design. A pilot study was conducted with 12 subjects walking repeatedly in both directions past the Kinect, which sampled at approximately 17 frames per second. The walking environment had some daylight present but was mostly dark for the sake of the Kinect image quality. Certainly real environments will not satisfy this condition and may have large windows and the like; however, it was desired to reach the best-case performance for this version of the algorithm. An example of the result quality is shown in Figure. We are using siamese network deep learning for distinguish between gait patterns.

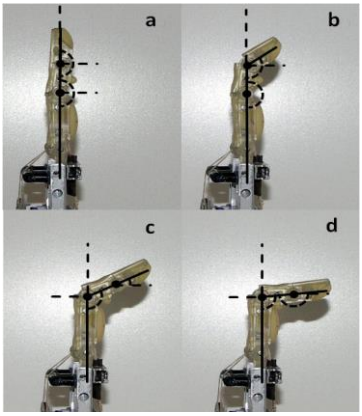




The principle of pulse diagnosis is that the vascular system is connected to all inner organs and, by this, carries information about them. This information can be read from the propagation of pulse wave, the so called pulse characteristic. This pulse wave is usually measured on the radial artery. With the help of this method some cardiovascular and inner organ diseases could be diagnosed by only one examination. The basics of this method were introduced in the Traditional Chinese Medicine. The main diasadvantages of the traditional method are the following: it's really hard to learn, and it's also subjective, the accuracy of diagnosis depends on the qualifications and concentration state of the practicioner. This is why an objective, automatized pulse diagnostic system is required. In our

laboratory we try to develop an automatized pulse diagnostic system based on our 3D tactile sensors, which was also developed here. Using this sensor, the pulse waveform can be measured non-invasively, without pain and side effects on the radial artery at the wrist. We have a clinical TUKEB license to make our measurements, record information of participants and publish our results.

Capsule endoscopy is a completely painless, non-invasive procedure, which gives the doctor images, similar in quality to those of conventional endoscopic techniques, of the gastrointestinal tract, including the esophagus and the whole small and large intestine. During development a 3D printed model of the intestine, obtained from a CT scan, was used in a robotics environment as a trajectory for the capsule to be led along by an automated algorithm. Our purpose was to improve and to automate the movement mechanism of the capsule, so that it could be moved to its appointed position and tilted by a given angle (with the speed of conventional endoscopic techniques). In our case the whole intestinal tract is monitored during a given trajectory, further on the capsule is expected to be able to examine selected regions in more detail, if needed. One of our long-term aims is to enable the user to control the capsule with the device from another room in real time via a robotic hand.



This work presents a design of an anthropomorphic biomechatronic hand, focusing on the design of the fingers and its bio-inspired flexor-extensor like low-level control. The kinematic description, the detailed explanation and presentation of the 3D CAD design are included. The description of the applied 3D tactile and magnetic sensors is also detailed in the article. Matlab simulation results and also the first experiments of the hardware prototype gave promising results and show that the approach can be an effective solution for the need of a hand-like actuator in robotics.

PUBLICATIONS

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[5] Miklós Koller, György Cserey: Spatial-temporal active wave computing using infrared proximity array, INTERNATIONAL JOURNAL OF CIRCUIT THEORY AND APPLICATIONS 40: (12) pp. 1209-1218 2012.