



### TYPE OF R+D RESULT

New technology  
 New product  
 New service

**New knowledge or skill**



### COMMERCIAL MATURITY LEVEL

Model or conceptual idea  
**Proof of concept (design)**  
 Validated in a controlled  
 environment  
 Validated in a real environment  
 Successfully implanted



### PROTECTION LEVEL

Non- applicable  
**Patent**  
 Software  
 Know - how  
 Utility model

<b>Name of the patent</b>	METHOD AND SYSTEM FOR ASSESSING BIOLOGICAL MOVEMENT
<b>File number</b>	US62/938.378; CA2020/051579
<b>Filing date</b>	
<b>Patent grant status</b>	Request
<b>Places where the patent is granted</b>	United States of America and Canada

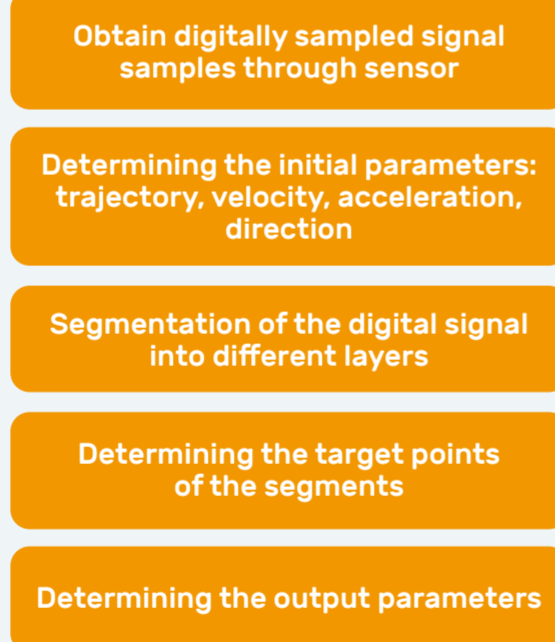
### Description of the solution. Problem solved

Human motion is the result of a set of a complex series of orders sent from the brain and executed by the muscle system. The result of human motions can be captured by different types of available sensors (accelerometers, tactile screens, digitising tablets, cameras and microphones, among many others).

When an individual suffers from a degenerative disease or development disorders, muscle response and/or synchronisation of the orders sent by the brain may be affected, and their effects may be reflected in movement.

In order to assess the orders and the muscle system response, a new information processing method is proposed. It has been developed in collaboration with the Polytechnique Montreal and it decompose motion in smaller categories, enabling a better analysis. So, this is an algorithm that enables obtaining parameters in real time and that also makes easier parametrization of different types of movement.

#### METHOD



This method can also be used in sensors such as Kinect™ and Leap Motion™ and intelligent devices such as smartwatches, smart bands, smartphones or tables in a way that by using available sensors, movement signals are collected and using the developed methodology enables obtaining the information.

Subsequently, the parameters obtained by this method will allow specialists (doctors, physiotherapists, logopaedists, etc.) to assess the level of the different diseases; to quantify the level of improvement related to a specific treatment or rehabilitation, as well as monitoring patients remotely.

Also, since this algorithm can be implemented in real time in intelligent devices, information may be processed with no need to be sent to another device in order to do so, saving battery and avoiding to send biometric data.

### Fields of commercial application

- R&D industry:** using this solution combined with existing ones (for example, artificial intelligence) would help to develop new models for preventing mental and neurodegenerative diseases.
- Health industry:** health services (public and private) could apply this system for improving early detection services for the aforementioned type of diseases. Patients would not need to go to the doctor since it could be used too for monitoring and evolution of these pathologies remotely. Also, it can send a message or an alarm to the patient in case that any parameter deviates, alerting patient to go to emergency services or to follow the instructions given by the doctor and that can be visualised on the device.
- Technology industry:** medical equipment manufacturers and developers and manufacturers of intelligent devices (smartwatch, smart band, smartphones...) may integrate this method in the products they sell.
- Pharmaceutical industry:** pharmaceutical companies may use this solution for monitoring the effectiveness of treatment and medicines administered to patients, regarding to the delay in the evolution of pathologies.
- Video gaming industry:** video gaming companies may use this solution for simulating human movements, since once motion parameters are obtained, they can be modified to generate a variation (US20190303422A1). It also enables improving the systems for identification of activities.
- Sports industry:** this solution allows to assess the improvement of a specific exercise; thus, it may be applied to sport or following traumatic injury rehabilitation. Doctors and sport physiotherapists may use this solution to provide objective data about the patient improvement in rehabilitation by sharing with them information about slight changes that may not be evident for them, encouraging them to carry on with rehabilitation.
- Biometrics:** this method provides information about the device's users by their movements or gestures, and if they are allowed or not to use the device.
- Education:** this method enables objective assessment of learning difficulties such as ADHD, ASD and lack of coordination. Psychologists and educators may use it for a better detection of such problems.
- Fish farms, livestock and veterinary industries:** This method may be also used to parametrize animal movement. Therefore, it can be used in sensors already being used in these sectors in order to monitor animal activity. This method presents substantial advantages since it can be implemented in computer systems of very small size and low cost. It does not affect the movement of the animal and not require continuous data transmission for subsequent processing in external computers, improving the battery life of these systems.

### Market opportunity

According to the Spanish Strategy in Neurodegenerative Diseases of the National Health System, neurodegenerative diseases are becoming more common due to the ageing of the Spanish population, generating high prevalence and social cost. These diseases, including Alzheimer's disease (AD), Parkinson's disease (PD), Huntington's disease (HD) and amyotrophic lateral sclerosis (ALS), have significant socio-economic implications, since they generate a relevant incapacity for work as well as a major economic expense due to the social and health care for all these people.

Many of these neurodegenerative diseases are related to age; therefore, the incredibly rapid ageing of population implies an increase of the prevalence of such pathologies. According to data of the Spanish Alzheimer's Confederation (CEAFA), more than 1.2 million people is affected by this disease in Spain. Taking into account the current trend towards an ageing population of the country, projections indicate that in less than 15 years, people suffering from Alzheimer will be over 7 million of patients.

This increase in the number of patients would have severe consequences, not only for patients and their families, but also for the sustainability of the national healthcare system. In the light of costs criteria, dementias are considered as the third cost cause behind cancer and cardiovascular diseases. Expenses generated by dementia are incremented according to its severity, the presence of related diseases and neuro-psychiatric disorders. In Spain, most of the expense caused by dementia is costed by the patient's family. According to estimations, the total cost in both public and private fields would rise to €48,000 million in a few years.

In view of the above, the solution hereby proposed contributes to improve social and health care of patients and their families, making the work of professionals taking care of them easier. In addition to this, this solution is aligned to the Spanish Neurodegenerative Diseases Strategy, and more precisely it's targeted to meet the following general goals: 1.2 "boosting early detection"; 2.3 "provide a better integral social and health care to affected population, their caregivers and families, based on the best evidence available and needed continued assistance"; 2.4 "people affected by NDD will be provided with the necessary health, rehabilitation and social supports" and 8.11 "to increase basic, clinical and transnational epidemiological research and NDD services".

In this sense, this solution helps the healthcare services in diagnosing patients with neurodegenerative diseases and favouring early detection, which has significant benefits such as use of non-pharmacological treatment; planning the most appropriate psychosocial intervention; reducing car accidents by recommendations about driving licences; making easier decision making for families with social and healthcare issues related to the patient or the healthcare costs generated by home care or specialised services.

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### Competitive advantage

- This solution provides advantages compared to other monitoring and parametrisation methods currently used:
- Low cost > Since it can be implemented in any device consisting of a movement sensor, tactile screen or microphone, it is proved that is a very low-cost solution.
- High information levels > Obtained information is parametrised in different levels for later use.
- Secure information > This method is able to work in any device with no need to transfer data to the Cloud or potent computers as a previous method for later processing. User has authorisation to share data. This way, user's biological information is not sent or shared; only the final result is transferred and it may be visible in the users medical, educative, psychological and/or sport information by doctors, educators, trainers or, when using with animals, veterinarians.
- Quick results > Processing of data can be done directly inside the device in which this method is implemented.
- Wide parametrisation spectrum > This algorithm may be used for decompose and assess different features or types of movements such as speech, writing or gestures.
- Widely applicable > It can be used for studying patients suffering from ADHD, ALS, Parkinson and other neurodegenerative diseases.
- Easy to use > It can be easily used by patients since it only needs using any of the user's mobile devices such as a smartwatch or a smart band.
- It is a non-invasive solution for the patient.