Licensing opportunity

Institut "Jožef Stefan", Ljubljana, Slovenija

center za prenos tehnologij in inovacij
na Institutu "Jožef Stefan"

Smart thermal therapy for patient rehabilitation

Field of use
Non-invasive real-time control of inner body temperature variables during therapeutic cooling or heating

Current state of technology
Stage of development: The solution has been demonstrated and clinically tested. The technology is ready for joint development of the commercial applications.

Patent status
TBA

Publication
TBA

Developed by
Jožef Stefan Institute

Reference
TBA

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Background

A new method and a device for non-invasive real-time control of inner (hidden) body temperature variables during therapeutic cooling or heating which is not possible with today's classical cryotherapeutic devices. The solution allow for personalization of thermal therapy process to meet the demands of a specific patient and different therapeutic protocols.

Description of the Invention

The patented solution is non-invasive real-time control of inner body temperature variables that are, for example, impossible to be measured non-invasively during therapeutic cooling or heating, based on the feedback for the individual patient's response provided by variables whose measurement is more feasible, i.e. temperatures on the body surface.

Main Advantages

☐ non-invasive control of inner body temperature during thermal therapy
☐ controlled cooling procedure by feedback information from the cooled region of the body
☐ temperature measurements on body surface
☐ personalisation of thermal therapy to achieve maximal treatment efficiency
☐ simple implementation and easy to use
☐ cost effective upgrade of existing thermal therapy devices
☐ more comfortable, more reliable and more efficient postoperative and post injury thermal therapeutic treatment with less complications.

The method uses machine learning to construct a predictive model for estimation of the controlled inner temperature variable based on temperatures on the knee skin. The machine learning method uses data generated from computer simulation of the cooling or heating therapy for different input simulation parameters e.g. input signals, initial and boundary conditions, or any combination of them. A simple set of fuzzy logic rules constructs the controller that sets the temperature of the cooling liquid based on the predicted error between the desired and the predicted inner knee temperature.

The solution is an upgrade of the existing computer-controlled cryotherapy devices with pre-programmed protocols in terms of heat extraction intensity and treatment time, which is already in use for the purpose of thermal therapeutic treatments. The device upgrade includes small thermo sensors (thermistors) and a support mini on-board computer with very little additional cost.

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