

INTREPID

A Virtual Reality Intelligent Multi-sensor Wearable System for Phobias' Treatment

INTREPID project aims at developing a multi-sensor wearable system for the treatment of phobias and situational anxiety. **INTREPID** project actively contributes to the treatment of phobias in an unobtrusive, personalized and intelligent manner.

Objectives of the project

INTREPID will serve to empower Community citizens in the management of their individual health, to provide health care professionals and facilities with a reliable phobias treatment and decision support tool and to create new opportunities for the medical wearable device industry. **INTREPID** will build upon the well documented increasing demand for "healthy lifestyle" products and services on the consumer side and offer potentially significant returns for those who chose to invest in the project outcome.

- The **INTREPID** project scientific objectives are:
- To effectively exploit the synergy in the information acquired from the various biometric sensors and develop new and efficient data fusion techniques, which will significantly broaden machine perception and enhance awareness of the phobia's states.
- To create an identification system of the physiological and phobia-based emotional state of a patient (phobia's state) that will be based on the association of the information coming from the various biometric sensors.
- To create a decision-making system that will project the current patient's phobia state into the future and draw inferences about the actions that should be taken in order to keep the patient in the desired phobia's state.
- To create a new centralised sensor management system that will use active and selective perception techniques in order to optimize the overall performance of the identification system and the tracking system.

“The therapist, using the Professional Site, will have the ability to interact with the patient and the VR environment during the VR exposure of the patient in order to help him control his fear”

- To create a powerful, intelligent and innovative human-computer interaction environment that will boost the research and work on affective wearable computing and machine emotional intelligence domain.
- The **INTREPID** project technological objectives are:
- To create an advanced tracking system that will optimally monitor the symptoms of phobias. The system will measure heart rate, perspiration rate, breath rate, muscle stiffness and if needed complementary modalities through a set of miniaturized wearable sensors that the patient wears during the treatment session.
- To create a sophisticated environment in a commercial wearable computer that will consist of:
- To create a professional site for psychologists and therapists that will assist them to design the next steps of the patient's therapy taking into account the individualized physiological and emotional state of each patient.

Project Description

Technical Approach: Virtual Reality exposure has potential as a new medium for a well-established treatment, graded exposure therapy. A medium that makes exposure less aversive and more attractive to patients is likely to increase the proportion who seeks treatment. The combination of the above with emotional intelligence based on physiological signals will vastly improve the therapeutic procedure and is worthy of investigation.



Expected Results & Impacts

INTREPID solution & functionalities are:

- A multi-sensor system that includes three different wearable biometric sensors. It will have the ability to monitor simultaneously respiration, skin conductance (GSR), blood volume pulse (BVP) and heart rate (from BVP). The multi-sensor system will be a Bluetooth-enabled and non-invasive system since the above monitored physiological signals can be sensed painlessly from the surface of the skin.
- A control unit with its peripheral devices - a head-mounted display (HMD) and virtual reality (VR) glove - both enabled with wireless communications.
- The clinician's laptop or personal computer (PC) or even personal digital assistant (PDA).

During therapy, the patient will be immersed in a VR environment where VR sceneries will be altered following scenarios that describe phobias situations.

The multi-sensor system will monitor the reactions of the patient during the exposure and measure a number of physiological signals. These data will be forwarded wirelessly into the control unit, which in turn will process the physiological signals. An intelligent mechanism, based on Fuzzy Logic, will undertake the responsibility to perform a feature-based fusion of the sensor information in order to infer - in real time - decisions on patient's physiological and phobia-based emotional state. According to the decisions, the scenarios and the VR sceneries, following a set of rules given by the therapist, will be altered dynamically in order to keep the patient in the desired physical and psychological levels. All the extracted information for the physical and psychological condition of the patient in a time frame during the therapy session will be transmitted wirelessly to the therapist's laptop or PDA (Professional site).

Thanks to the use of the **INTREPID** system, the therapists will be able to taking promptly the best possible decision for diagnosis and treatment of phobias using a number of scenarios in therapeutic session in order to expose the patient in virtual reality phobias situations.

INTREPID will achieve this result by introducing knowledge-based adaptive systems that combine specialised feature-based information with "anytimeanywhere inferencing" in order to support automated diagnosis and decision support.

Major benefits expected by all the end users by the adoption of the **INTREPID** system is to increase the number of patients who are able to better manage their individual health, provide better services through faster patient processing and analyzing, increase the number of correct diagnoses and reduce costs per patient and medical errors .

Thanks to the introduction of user-friendly and ergonomic multi-sensor system, it is estimated that, with the same personnel and the utilization of **INTREPID**, a 15% increase in speed of phobias treatment, thanks to more data available on the patient received.

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