

Body Perception XR Rehabilitation Program

Neurocognitive rehabilitation program for patients suffering from discomfort (phantom pain) and hemiplegia due to stroke





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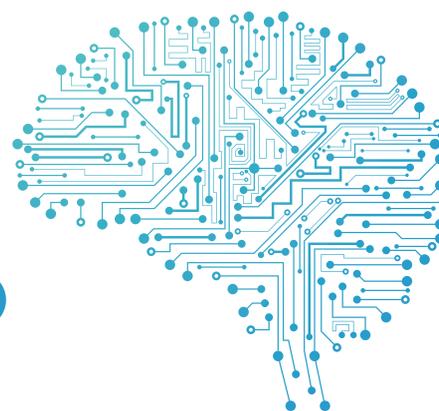
01 Purpose of use



Program name	TiU (Treat in Universe)
Applied technology	Virtual Mirror Therapy
Major customers	discomfort and paralysis patients

This product is mainly used to rehabilitate patients with difficulty using ipsilateral limbs. It visualizes the affected and normal limbs moving symmetrically on the screen in the VR device.

It is a brain plasticity treatment program that relieves discomfort / paralysis symptoms by re-injecting normal information into the affected side during the process.



Brain plasticity therapy (mirror therapy)

Providing visual information different from reality to the patient can reduce discomfort.

Medical Correlation of Mirror Therapy

Development of pain therapy using mirrors.

When the illusion that the painful body part moves without causing pain, the pain patients feel in the corresponding area is reduced.

– V.S. Vilayanur Subramanian Ramachandran, Indian Neurosurgeon

02 Product background

Prescribing gabapentin, an opioid-type narcotic analgesic

- Occurrence of side effects (perspiration, urinary retention, malaise, changes in blood components, etc.)
- Severe misuse problem caused by its addiction
- In the case of the United States, as of 2017, **47,000 people** misused drugs, and **1.7 million people** suffered from addiction.
- According to the '2017 Annual Compilation of the Leading Causes of Preventable Death in Americans' published by the National Safety Council (NSC) in February, the rate of death due to opioid misuse was 1 in 96, which is a higher rate than traffic accident (per 103) 1 person).

Source: National Vital Statistics System Mortality File Reference Survey

THE OPIOID EPIDEMIC BY THE NUMBERS



48,006

Overdose deaths from synthetic opioids are higher than those from methadone (US, 2020)



10.1 million

People have abused opioid prescriptions in the past year.
(As of 2020, USA)



1.6 million

People had opioid use disorder last year
(as of 2020, USA)

Analog passive rehabilitation treatment

- **Help from physical therapist** ►► conduct and pay average rehabilitation time per patient
- **Boring and repetitive training method**
- **Can only be treated in a hospital**
- Quantitative measurements are unavailable and is **expensive**

Excessive treatment cost

- Social costs caused by discomfort ►► **About \$560 billion ~ \$635 billion (\$2000 per person)**
- **36 million** Americans experience discomfort that prevents them from performing their job duties annually, resulting in
- Reduced productivity costs reach about **\$299 billion to \$325 billion** every year.

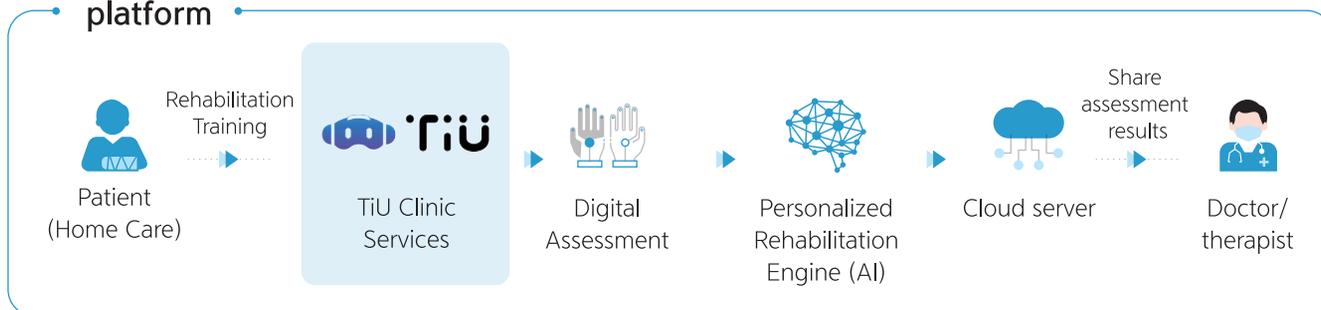
03 Shape and structure

Securing various rehabilitation solutions combining AI-based H/W S/W

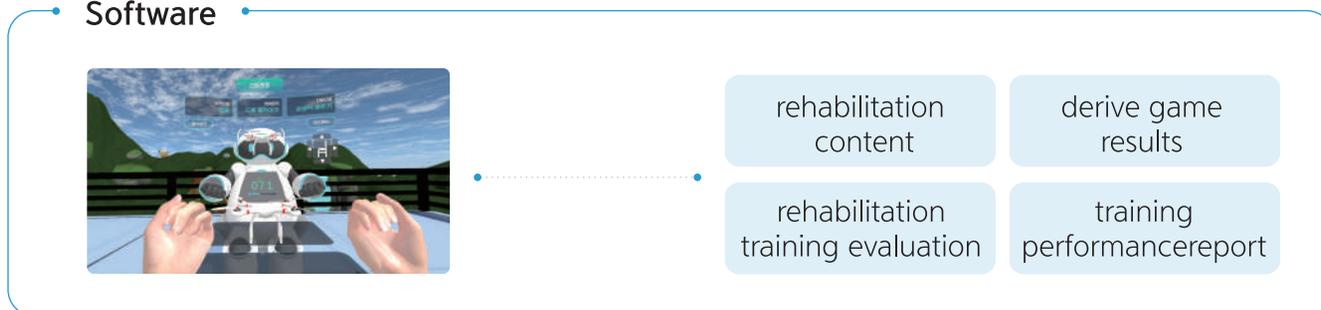
TiU Rehabilitation Solution Product Full Line-up



platform



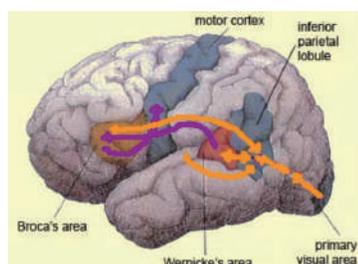
Software



Rehabilitation hardware appliance



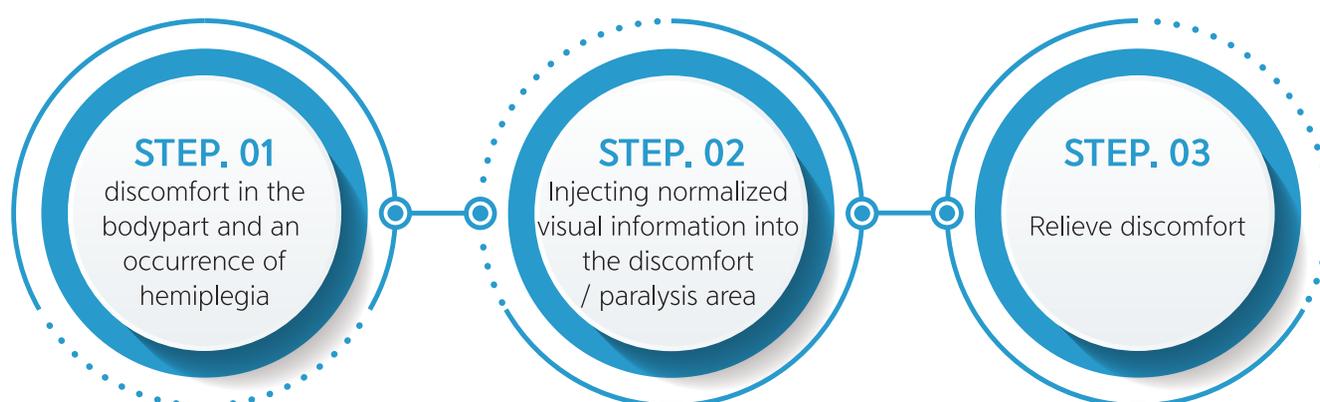
04 How it works



Mirror therapy was first introduced by Ramachandran, a behavioral neurologist, and was designed based on the principle of brain plasticity, in which the cranial nerve can be structurally and functionally changed.

Once the visual feedback is provided through the mirror, the reduced sensory integration activates the pre-motor cortex region and induces normal movement. If the process is repeated, the cranial nerve is changed, and motor function can be restored.

By conducting the same exercise on the normal limbs in real space and the virtual limbs in virtual augmented reality, the sensory information from the left and right upper limbs is integrated into the brain to form a single sensory representation, which is conveyed through the motor system that results in the reintegration of perception-motor coordination of the virtual limbs that relieves discomfort.



Narcotic analgesics and VR treatment replacement effect

A case of a study on VR digital treatment and narcotic analgesic replacement effect

Subject 50 patients with severe discomfort lying in bed all day.

Results The pain index in the VR test group was lower than that of patients who watched regular TV, and in severely ill patients, the results of discomfort-related sectors were lowered by about 3 levels.

The mechanisms of VR and opioid drugs appear to be similar.

Through this, "we can evaluate that it can reduce the everyday interference caused by discomfort and improve the quality of life."

– Professor Kyungsang Yoo, Seoul National University College of Medicine, presented a case at the 2021 Korean Academy of Medical Sciences Conference

05 Performance

hardware



- 1 Detachable PCB-IoT sensor connector
- 2 Link to VR devices (Metaquest 2 or higher)
- 3 Bluetooth 9Dof-Motion sensor
- 4 Insertion of vibration motor (2 lines)
- 5 Insert the rechargeable lithium battery module

Software

Accuracy A criterion that indicates how close virtual, augmented, and real tracking is to real values.

The positioning accuracy using augmented reality for this software depends on the matching accuracy of the image and the patient, and the error is within 2mm.

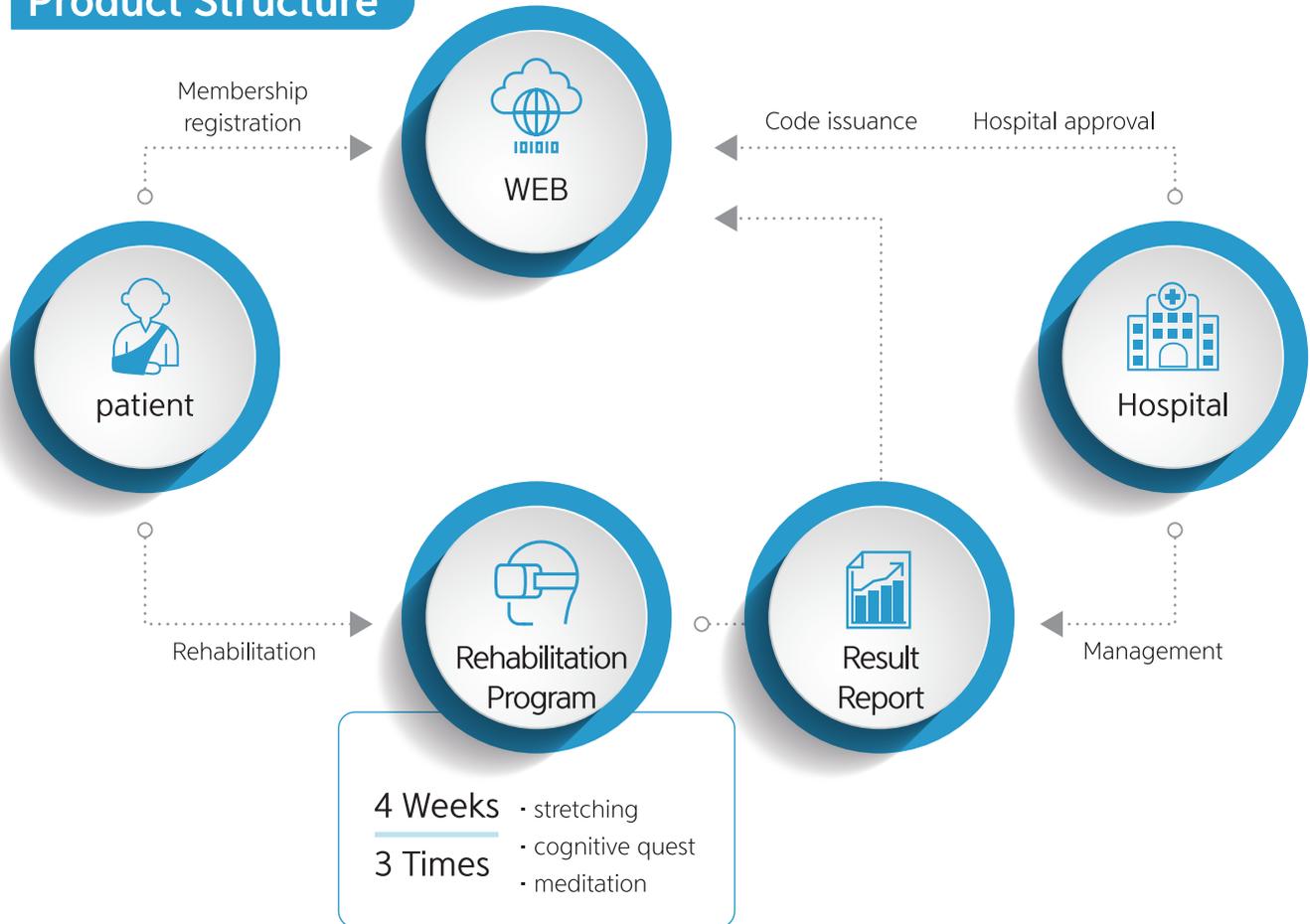
Response speed The speed at which the user's eyes, head, and body movements, including arms and legs, are reflected and updated as a virtual image
Response speed within 20ms

Reproducibility

- 1 **Field of view** The angle of view of the image displayed on the HMD device.
FOV hor. – 104.00
FOV ver. – 98.00
FOV diag. – 113.46
- 2 **Resolution** The resolution of the image displayed on the HMD device
Number of horizontal x vertical pixels 1832 x 1920
- 3 **Frame rate** Frames per second of virtual reality software
60Hz per second

06 How to use

Product Structure



Registration and Login

- Sign up as a member at www.tiu.kr and proceed with institution (hospital) approval
- Log in to the program with the membership code issued after approval



Membership sign-up



institutional approval



membership code issuance



program log-in

06 How to use

Rehabilitation curriculum

① Weeks and sessions

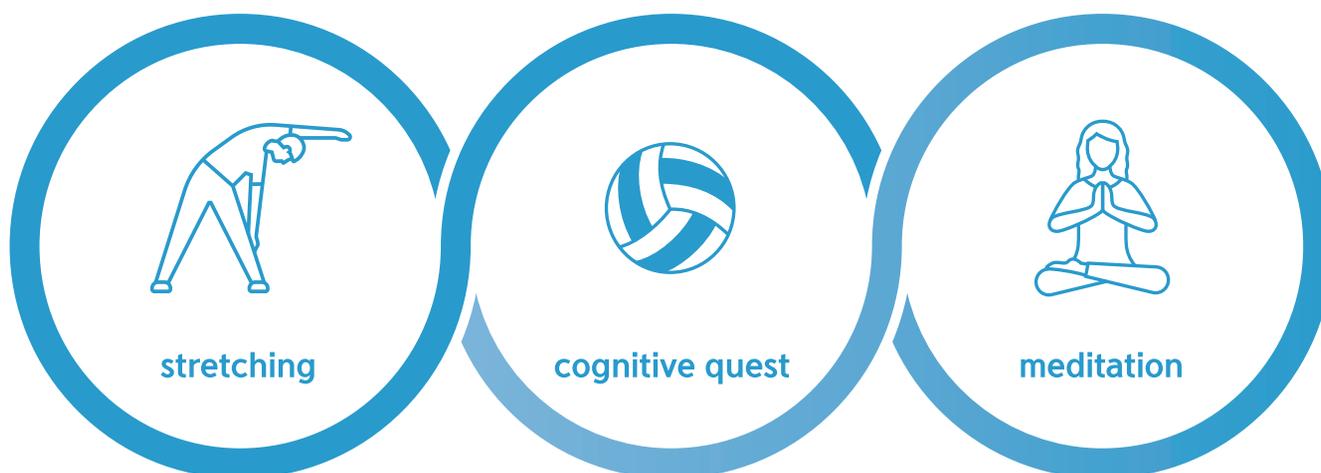
3 sessions per week consisting of 4 weeks, the minimum period for rehabilitation effects

The minimum period of use



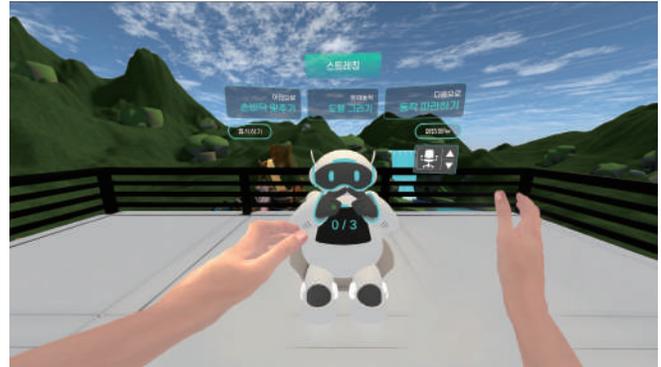
② Rehabilitation Program

Basic stretching + Rehabilitation content by difficulty/exercise/cognitive ability + Meditation



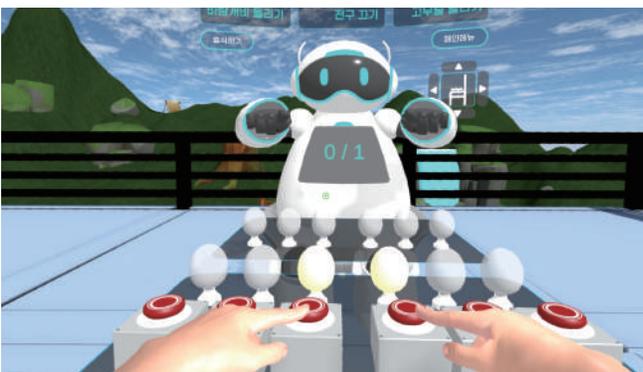
01 stretching

relief tension with simple stretching methods related to rehabilitation training



02 Cognitive quest

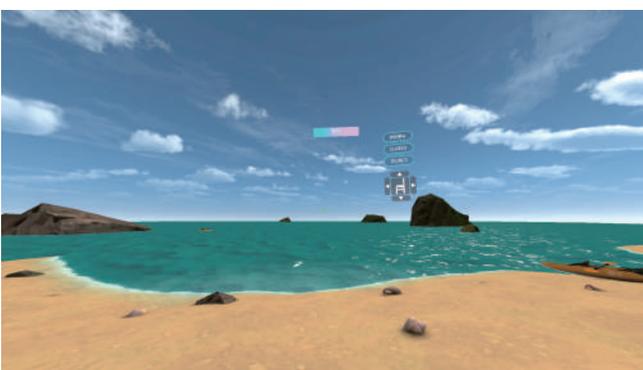
Various cognitive exercises of rehabilitation contents that increase the concentration of treatment for patients with discomfort / paralysis



*The image is an example, and various additional contents are provided in the program

03 Meditation

stress management for patients through a program that helps emotional stability



06 How to use

3 Result report

Cognitive content performance ability and VAS pain index determination



deliver questionnaire through mobile phone after the program ends



Check progress with graphs each week



Hospital management

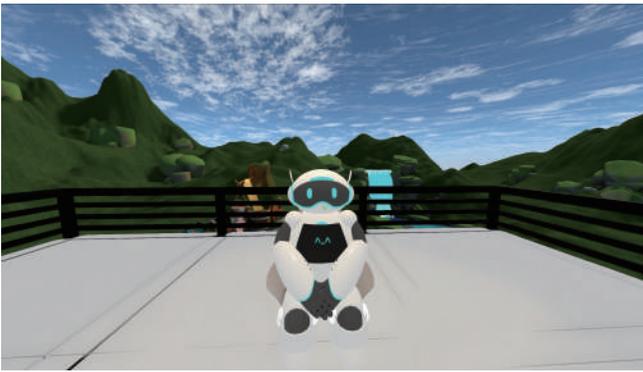
- **Membership management**
 - Membership registration / rejection of membership application to the hospital
 - Register / reject a member who has applied for transfer from another hospital to the hospital
- **Patient data management** : Data analysis and counseling of patients who have joined the hospital
- **Device management** : VR HMD battery and hygiene management before the patient visit



Features

① Guide character considering elderly patients

As the target base includes many elderly patients, a guide character called 'Meta' is used to use the difficulty level and operation method easily.



② Background custom feature

A variety of nature-friendly backgrounds can be selected, such as forests and seas, to stabilize the mind and body.







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Risingcraft Co., Ltd. pursues XR Business that values the world.

We imitate behaviors that are limited in time and space to be implemented in real life in an augmented virtual environment to connect me, us, and the world through the good influence of technology focused on utility.

We will become a company that provides top-quality products in the future through continuous research and development in the XR field and know-how. Thank you.

📍 293, Bupyeong-daero, Bupyeong-gu, Incheon #906

🌐 www.risingcraft.kr