UKM FILE MANAGEMENT SYSTEM

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Abstract

Selain kadar kemalangan jalan raya yang semakin meningkat, kesannya bukan sahaja menjejaskan kesihatan fizikal tetapi juga menyebabkan masalah psikologi yang serius, contohnya, fobia kemalangan kereta. Ia membawa kepada perasaan ketakutan dan kebimbangan yang kuat pada pesakit apabila mereka terdedah kepada situasi trafik atau memandu, dengan ketara menjejaskan kehidupan harian dan interaksi sosial. Rawatan tradisional, seperti terapi pendedahan, berkesan tetapi seringkali terhad dalam kejayaannya kerana tahap rangsangan dalam senario dunia sebenar terlalu kuat untuk dihadapi oleh pesakit. Dengan perkembangan teknologi realiti maya (VR), terapi pendedahan realiti maya membuka jalan baru untuk rawatan fobia kemalangan kereta. Tujuan projek ini adalah untuk mereka bentuk sistem rawatan untuk fobia kemalangan kereta menggunakan teknologi realiti maya, di mana pesakit boleh secara beransur-ansur menyesuaikan diri dan menghadapi situasi memandu dengan mensimulasikan pelbagai persekitaran memandu, seperti jalan bandar, lebuhraya, dan jalan luar bandar, serta mengatasi fobia mereka. Program ini mencipta pelbagai senario memandu maya dan menggabungkan faktor-faktor yang boleh dikawal, seperti cuaca, ketumpatan trafik, dan masa hari, untuk menyediakan persekitaran rawatan yang selamat dan boleh dikawal kepada pengguna. Apabila mereka secara beransur-ansur terbiasa dengan senario yang pelbagai ini, pengguna boleh mendapatkan kembali keyakinan memandu dan fungsi sosial normal mereka. Kajian ini bukan sahaja menunjukkan kemungkinan aplikasi realiti maya dalam terapi psikologi, tetapi juga menyediakan strategi rawatan yang baru dan diperibadikan, membawa penyelesaian baru kepada pesakit dengan fobia kemalangan kereta. Dengan kemajuan dan penambahbaikan teknologi realiti maya pada masa depan, sistem ini akan digunakan dalam lebih banyak terapi kesihatan psikologi untuk membantu lebih ramai pesakit meningkatkan kesihatan mental mereka dan memulihkan kehidupan normal.

Kata kunci : Fobia kemalangan kereta, Terapi pendedahan realiti maya, Senario memandu maya yang boleh dikawal.

Abstract

In addition to the increasing rate of traffic accidents, the effects not only affect physical health but also cause serious psychological issues, for instance, traffic accident phobia. It leads to a

feeling of intense fear and anxiety in the patients when they are exposed to traffic or driving situations, greatly affecting daily life and social interactions. Traditional treatments, such as exposure therapy, are effective but often limited in their success since the level of stimulation in real-world scenarios is too intense for patients to handle. With the development of virtual reality (VR) technology, virtual reality exposure therapy opens up a new avenue for the treatment of traffic accident phobia. The aim of this project is to design a treatment system for traffic accident phobia using virtual reality technology, where patients can gradually adapt and confront driving situations by simulating various driving environments, such as city streets, highways, and rural roads, and overcome their phobia. The program creates a variety of virtual driving scenarios and incorporates controllable factors, such as weather, traffic density, and time of day, to provide users with a safe and controllable treatment environment. As they progressively get used to these varied scenarios, users can regain their driving confidence and normal social functions. Not only does this study demonstrate the application possibilities of virtual reality in psychological therapy, but it also provides a novel, personalized treatment strategy, bringing patients with traffic accident phobia a new solution. With the advance and improvement of virtual reality technology in the future, this system will be applied in more and more psychological health therapies to help more patients improve their mental health and resume normal life.

Keywords： *Traffic accident phobia, Virtual reality exposure therapy, Controllable virtual driving scenarios.*

1.0 INTRODUCTION

With the acceleration of urbanization and the increase in the number of motor vehicles, the frequency of traffic accidents continues to increase, which not only brings huge economic losses to society, but also has a profound impact on people's mental health. Many people may develop traffic accident phobia after experiencing a traffic accident (Behaviour Research and Therap,Taylor, J. E., & Deane, F. P. 2000). This psychological disorder causes patients to have strong uneasiness and fear when facing vehicles or driving scenes, thus affecting daily life and social interactions.

According to the National Transportation Safety Administration (NHTSA), traffic accidents are one of the leading causes of human death, causing hundreds of thousands of casualties worldwide every year (NHTSA, 2021). Many studies have shown that the sequelae of traffic accidents are often accompanied by psychological problems such as phobia and anxiety. These problems not only affect an individual's physical and mental health but may also lead to impairment of social functions. Therefore, finding effective treatments to help these patients restore their mental health has become an urgent social need.

In recent years, the development of virtual reality (VR) technology has provided new possibilities for psychotherapy. Research shows that VR can create a safe and controlled environment for patients, in which real driving scenarios are simulated, allowing patients to gradually face and overcome their fears (Wald, J. 2004). This approach not only reduces patients' anxiety but also improves their self-confidence, helping them readjust to driving.

Traffic accidents pose a growing social challenge, with many people facing psychological problems such as phobias and anxiety disorders that disrupt their daily lives and social functioning. To address this issue, the development of virtual reality (VR) technology has emerged as a promising psychotherapeutic solution. VR provides a controlled and safe environment where people can be gradually exposed to driving scenarios, allowing them to confront and alleviate their fears. Studies have shown that VR-based exposure therapy can help reduce anxiety, increase self-confidence, and help people readjust to driving. This technological advancement is seen as an important tool to address a pressing social need, restoring the psychological health of traffic accident victims.

2.0 LITERATURE REVIE

Virtual reality (VR) is a technology that uses computer-generated three-dimensional images and scenes to enable users to interact within a virtual environment. Its immersive and interactive nature makes it an ideal tool for treating anxiety and phobias. VR is categorized into non-immersive VR (e.g., desktop games) and immersive VR (e.g., experiences via devices like Oculus Rift). Immersive VR, in particular, offers a more realistic sense of presence, which is crucial for exposure therapy.

A phobia is an excessive, irrational fear of specific objects or situations. Traffic accident phobia, as a type of specific phobia, often develops after traumatic experiences. It triggers physical reactions (such as rapid heartbeat and sweating), psychological stress, and limitations in daily life—for example, avoiding driving or normal travel—thereby reducing quality of life and social functioning. Studies indicate that traditional exposure therapy is insufficient for treating this phobia, as it fails to replicate realistic scenarios or alleviate long-term fears.

Existing VR applications for phobia treatment include oVRcome, PsyTech VR, and XRHealth. oVRcome focuses on self-guided exposure therapy for common phobias and is compatible with smartphones; PsyTech VR integrates cognitive-behavioral techniques with over 80 scenarios, targeting professionals; XRHealth combines VR with real-time tracking and remote consultations, suitable for clinical settings. However, current VR applications have limitations, such as lacking sensory feedback, potential side effects like dizziness, and the need for longer-term research to verify the durability of treatment effects.

Table 1 System comparison

Application	oVRcome	Psytech	XRHealth
Device	Smartphone + VR headset	PC + VR headset	Meta Quest 2, Meta Quest Pro
Language	English	English, Russian, Ukrainian	English, with localized versions depending on region
Main function	Self-guided exposure therapy for phobias & social anxiety	Therapist-led sessions for anxiety, PTSD, phobias, and cognitive training	Remote therapy with real-time therapist support for physical and mental health
Technology	VRET (Virtual Reality Exposure Therapy), CBT-based modules	VR exposure scenarios, AI integration, biometric feedback, therapist dashboard	FDA-registered VR medical software, biofeedback sensors, telehealth platform
POI Filter Types	Phobia types Fear of heights Fear of flying Fear of public speaking	Treatment goals PTSD Social anxiety Phobia type Environment selection	Health condition categories Anxiety ADHD Motor function
Personalized Recommendation	Initial questionnaire tailors content to user needs; adaptive therapy	Therapist designs customized therapy journey with session logs and feedback	Initial evaluation determines treatment plan; therapist adjusts in real-time

3.0 METHODOLOGY

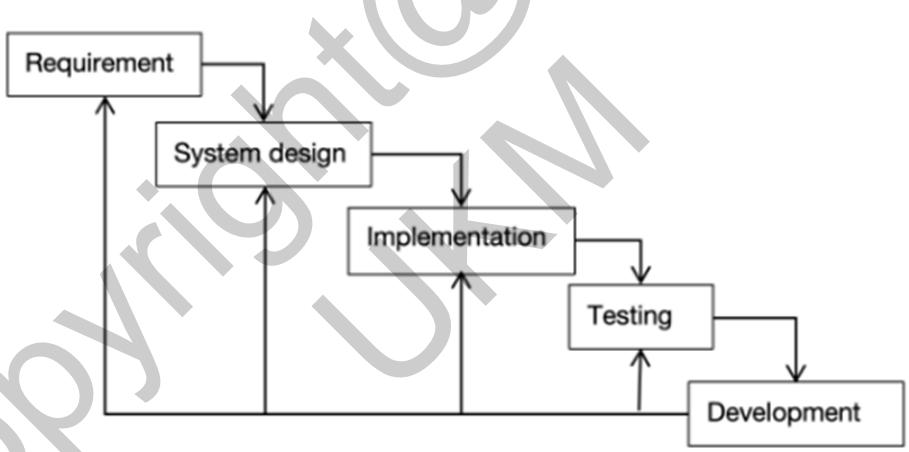
This project adopted an incremental development model, which allows for gradual addition of functionalities in each iteration. Continuous user testing and feedback collection were conducted to adjust and optimize the system according to user needs. The development process included requirements analysis (2 months), scene design (3 months), user interface design (2 months), development and testing (3 months), user feedback collection (1 month), and improvement and optimization (1 month).

In terms of system design, the Model-View-Controller (MVC) architecture was employed to separate data processing, interface display, and user input, enhancing scalability and maintainability. Core modules included a virtual scene generation module (responsible for simulating environments with factors like weather and traffic flow), a psychological feedback monitoring module (tracking physiological indicators such as heart rate), and a personalized treatment module (adjusting scene difficulty based on user progress). Algorithms such as Q-

learning (for scenario generation) and support vector machines (for emotion prediction) were used to dynamically adjust scenes based on user feedback.

System testing adopted a black-box testing strategy, focusing on functional and performance testing of core modules such as user registration/login and virtual driving scene generation. Test cases included verifying successful user registration, normal login, scene loading, parameter adjustment, and driving interaction responses to ensure the system met therapeutic requirements.

This project adopted an incremental development model. This model was chosen for its flexibility and adaptability, allowing functionality to be added gradually in each iteration, ensuring that the final product meets user needs. At each development stage, we will continuously conduct user testing and feedback gathering in order to adjust and optimize according to the needs of users



FIigure 1 Incremental development model

4.0 RESULTS

System testing was conducted on an Acer laptop (configured with an AMD Ryzen 7 6800H processor, Windows 11 operating system, and 16GB memory). All modules passed functional validation, and the system performed stably overall. Virtual driving environments loaded quickly, though some scenes (e.g., nighttime rain + highway) loaded slightly slower on low-end devices, suggesting the need for resource optimization.

In tests of the user registration and login module, new users could successfully register and be redirected to the login page. Entering correct account information allowed smooth access to the main interface, while invalid inputs triggered the prompt "Incorrect username or

password," all meeting expectations. Tests of the virtual driving scene module showed that the system could correctly load scenes like daytime urban environments. After adjusting parameters such as weather (rainy), traffic density (peak), and time (night), scenes updated in real time with effects matching the settings. Simulated operations like steering, accelerating, and braking elicited timely vehicle responses without lag.

Issues identified during testing were resolved: sudden difficulty jumps in personalized recommendations were fixed by adjusting algorithm threshold ranges; lag in nighttime scene loading was addressed by optimizing lighting and shadow rendering logic. Overall, core system functions met design expectations and therapeutic requirements.

This is the first-person perspective of the user who is driving within a virtual highway scene. The system simulates effects of rainy weather from the side windows of the vehicle and adds mountain curved road sections to enhance immersion and difficulty. The setting helps patients gradually get accustomed to driving under challenging weather conditions in a protected virtual setting.

FIigure 2 Rainy driving interface for motorway scenarios

This is the driving interface for an urban virtual environment. The user can switch between different weather conditions and environments (e.g., Rain, Snow, Expressway) via a head-pointing controlled virtual menu. The unit provides additional interactivity and personalization to the system and facilitates quick switching of treatment scenarios based on the condition of the patient.

FIigure 3 City street scene and environment switching menu

Figure 4 shows the the hand movement of the user through virtual driving simulation by means of more precise steering wheel turns and dashboard response to imitate real driving. First-person operation field of vision and real-time motion feedback enable users to advance step by step to acclimate themselves to car control, creating the feel of step-wise exposure therapy.

FIigure 4 Dashboard and hand manipulation simulation in virtual driving

5.0 CONCLUSION

This project designed and implemented a virtual reality-based treatment system for traffic accident phobia. The system simulates various typical driving environments (e.g., urban roads, highways, rural roads) and incorporates adjustable factors like weather, time, and traffic flow, providing patients with a safe, progressive, and controllable treatment environment. Black-box testing verified that the system is stable and reliable, with good performance in scene loading

and user interaction. Core functions align with design requirements, effectively supporting patients in gradually adapting to driving, reducing anxiety, and improving treatment outcomes.

The system's strengths include strong immersion and interactivity through a first-person perspective, realistic driving experiences, support for scene/environment switching to meet personalized treatment needs, a modular architecture, and a user-friendly interface for easy maintenance and use. However, limitations exist, such as slow loading of complex scenes on low-end devices, a relatively simple personalized recommendation algorithm, and unimplemented physiological feedback mechanisms, which require further optimization.

Future improvements will focus on three areas: optimizing system performance on low-end hardware through resource compression and dynamic loading; integrating physiological signal acquisition modules (e.g., skin conductance, heart rate) to adaptively control therapy scenes based on user emotional states; and enhancing scene recommendation logic using artificial intelligence algorithms to dynamically adjust difficulty based on users' historical data and performance. These enhancements will make the treatment experience smoother and more intelligent, further increasing the system's clinical value.

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