

MEASURING AND MITIGATING RACIAL PREJUDICES BY MEANS OF SERIOUS VIDEO GAMES

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Abstract

Prejudices are a result of normal human functioning, and everyone is susceptible to them to one extent or another. People have the possibility and the need to categorize objects, events, individuals, and are convinced that their perceptions of the world around are true and adequate. Nowadays, prejudices and discrimination based on race are still widespread that very often lead to the emergence of prerequisites for inter-ethnic and inter-racial conflicts. Hence, it is very important to have a tool for detecting and treating prejudices of an individual person in an easily accessible, effective and ecological way. This paper proposes a novel and ecological approach for this research area, using a rich maze video game with embedded personalized puzzles of various type. We focus on prejudice based on race and how this type of prejudice of individual persons can be effectively measured and mitigated through playing a serious game.

Keywords: rich maze game, serious game, APOGEE, racial prejudices.

1 INTRODUCTION

Allport [1], one of the founders of the psychology of personality and pioneer in describing the genesis of prejudice in the psychology of individuals, defined prejudice as a “feeling, favourable or unfavourable, toward a person or thing, prior to, or not based on, actual experience”. One of the main reasons for studying prejudices is the well-known periods in the world history of discrimination and horrible abuse of certain groups of people, such as Jews, African Americans, women, or homosexuals [2]. Currently, racial stereotypes are an actual problem in contemporary society [3]. People “sees only what the mind is prepared to comprehend” [4]. Therefore, persons do not perceive their prejudices whether positive or negative and even, very often, these prejudices are non-conscious [5]. The most common types of prejudice are based on the following factors: race, gender, age, nationality, social status, religion, and sexual orientation. This article is focused on prejudice based on race and how this type of prejudice of individual persons can be effectively measured and mitigated through playing a rich maze video game.

It is difficult to detect and measure racial prejudices because it is mostly unconscious. Main methods for measuring racial prejudice are analysis of answers of specially prepared questionnaires and analysis of reaction and observational data from field and laboratory experiments. All these methods try to involve the participant in a realistic environment most often using pictures and videos in the questionnaires. However, this is not sufficient for simulating the real world or require a lot of human and laboratory resources.

Serious games are a proven paradigm for building ecologically-balanced environments where users perform different tasks in a more natural way than filling questionnaires or solving assessment tests with closed questions [6]. Thanks to their nature, serious games can serve as a tool with ecological validity that permits to elicit and measure the human behaviour in a more confident way taking advantages of the positive effect of multimedia, emotional effects, and immersive engaging [7]. The current study proposes a maze serious game to be used in order to be substituted the standard instruments for measurement and reduction of prejudice in terms of racism such as questionnaires, involving in hypothetical or actual situations, or measuring psychophysiological parameters in situations involving pre-determined stimuli. Measurement and identifying of prejudice based on the race of an individual will be achieved by a combination of tracking and monitoring of reactions and responses of an individual person to various stimulus and situations that are part of the game scenario. The serious game will be constructed like a rich maze using the APOGEE open software platform.

2 BACKGROUND

2.1 Approaches for measuring racial prejudice

In the field of psychology research exists various approaches for identifying and measuring racial prejudice. Generally, they can be divided into three main groups [8]:

- a) *explicit scales* – this method measures level and direction of racial prejudice analyzing participants' responses to a questionnaire. There are several instruments using this method such as Perceived Racism Scale [9], The Perceptions of Racism Scale [10], The Index of Race-Related Stress [11], Perceived Ethnic Discrimination Questionnaire Community Version [12]
- b) *tasks* – it involves participants in hypothetical or actual situations in the form of questionnaire and analyses their choices. Usually, this type of assessment is conducted in a laboratory in a controlled environment. Tasks are presented in the form of discussion [13] or each question of the prepared questionnaire contains a problem situation including images or video and the participant has to choose one of the listed decisions [14].
- c) *implicit measures* – they are based on behavioural responses as well as analyse and monitoring of psychophysical metrics such as facial electromyography, heart-rate or brain imaging measured in situations involving pre-determined stimuli. One of the most widely used instruments based on this approach is the Implicit Association Test (IAT) [15]. In it, the analysis of the presence and extent of racial prejudice is based on the choice of a particular participant between 'BAD' and 'GOOD'.

Usually, it is very difficult to recognize this behavior in an explicit way, because prejudices are rather unconscious. The purpose of the above-mentioned types of approaches is to put participants in a situation that will cause behaviour showing the presence and extent of racial prejudice. These situations have to be as more realistic as possible to make the results of the experiments more accurate and reliable. It would be difficult to achieve that with the available instruments using for this purpose filling questionnaires or solving assessment tests with closed questions. One possible decision of this problem is to be used serious games instead of questionnaires. The content of questionnaires could be designed as a game scenario and players' behavior in different situations could replace answers of questionnaires.

2.2 Serious games in the psychology field

Serious games (SG) are video games developed not only for fun but also with other goals such as advertisement, simulation, training, etc. In the last years, SG mark significant progress. They are used in global education and training market, also in health care, engineering, medicine, psychology and many other areas [16]. They have proved to be an effective tool for creating more ecologically valid stimulus presentation in an environment where users perform different tasks in a more natural way [17].

SG are used in many psychological domains such as psychotherapy [18], sports psychology [19], and social interaction [20] due to a number of advantages that are offered compared to traditional experimental instruments and tools such as greater control, possibility of creating more ecologically-balanced environments, using of different type of multimodal sensory input such as audio, haptic, olfactory, and motion to be experienced simultaneously to the graphically rendered environment or objects [21]. SG are able to establish a feeling of presence in a real world and are capable to make deeper our understanding and feelings, in a very interactive and immersive way.

2.3 The apogee platform for automatic maze game generation

The APOGEE is an open software platform for easy building and generation of maze games [22]. It allows a non-IT specialist to create easily a set of SG with embedded intelligent virtual players in them. The labyrinths of the platform are presented as graphs, where each node is a hall from the maze. Nodes are connected between themselves with doors and corridors. The platform provides a drag-and-drop editor for creating a game and allows automatic generation of adaptive video mazes games. It gives opportunity the game creator to include in each room different audio-visual interior, didactic content and gaming assets. Each room of the maze could be used with different purposes and

presents a particular challenge. This challenge is implemented in the form of a game and depending on the achieved result in the gameplay the player will be able to open one or more doors.

The APOGEE platform contains four modules as follows [23]:

- *maze connectivity editor* – allows non-IT people to design labyrinths with various forms, including halls connected to each other by unlocking doors. Structure of the maze, connections and relationships between rooms, placement of doors and properties of corridors are described as metadata in an XML document;
- *maze interior editor* – it provides a drag-and-drop tool that allows being defined learning objects with adaptable content according to the player model characteristics and the chosen game strategy, puzzle mini-games embedded into the maze halls, and audio-visual assets to represent the learning content. maze halls interior as well as forms of labyrinths are described in an XML document;
- *maze validator* - the maze game created with the *maze interior editor* together with the *maze connectivity editor* is based on a pre-defined XSD schema and its metadata described in the XML document can be exported. In this process the predefined XSD scheme is used to validate the exported XML document representing the labyrinth;
- *XML generator* – if the XML file, containing the metadata information from the *maze connectivity editor* and from the *maze interior editor*, is compatible with the XSD schema, it can be generated a rich maze game for a chosen platform such as Windows, Android, MacOS, etc.

3 METHODOLOGY

The current study proposes to be substituted standard instruments for measurement and reduction of prejudice in terms of racism with a novel way and plan to conduct an experimental validation of an ecological environment, built in form of SG developed for measuring and mitigating of racial prejudice. The main research question of the current work is: How can we effectively: (1) measure and (2) mitigate prejudice based on the race of individual persons in an ecological and dynamic way through playing a 3D video game (instead of measuring them by questionnaires and reducing them through therapeutic sessions)?

Considering the multidisciplinary nature of the current study, its research methodology will apply a mixed methods research approach [24] and an iterative and incremental agile approach extending with learning by doing the methodology defined by Kirjavainen [25] especially for generation of game concept, design, and development with following phases:

- 1 Systematic research of state-of-the-art (SOTA) in racial prejudice and serious games for personality psychology, including identifying, evaluating, and interpreting available sources of information in greatest digital libraries such as IEEE Explore¹, ACM², and Google Scholar³. The systematic study will follow the procedures defined by Kitchenham [26] for the stages of planning, implementation, and reporting, regarding the identification of research, study selection, study quality assessment, data extraction, and data synthesis;
- 2 Design of a multidimensional framework of observable and quantifiable metrics for measuring of prejudice based on race, targeted especially to applications in video games. This multidimensional framework will be based on the SOTA done in the previous phase;
- 3 Development of questionnaires for measuring racial prejudice based on the previous phase. It will contain questions that are appropriate to be transformed into a game scenario;
- 4 Development of a 3D video game module for measurement of prejudice in terms of racism – it includes two sub-stages as follows:
 - a. Design of the 3D game module and non-linear storytelling engine;
 - b. Implementing of the designed gameplay.
- 5 Development of a 3D video game module for mitigation of prejudice in terms of racism - it includes two sub-stages as follows:

¹ <http://ieeexplore.ieee.org>

² <http://dl.acm.org>

³ <http://scholar.google.com>

- c. design of the 3D game module and non-linear storytelling engine;
 - d. Implementing of the designed gameplay.
- 6 Practical validation the effectiveness of the game regarding measurement and mitigation of racial prejudice. For this purpose it will be conducted two consecutive studies:
- e. Study 1 – the goal of this study is a validation of the serious game as an effective instrument for measuring of the racial prejudice of individual persons. Participants in this study will be at least 30 students (according to Sandelowski [27]) and their racial prejudice will be measured in two ways – first, it will be conducted evaluation through standard psychometrical tests and questionnaires and, next, (2) through a game session using the module of measurement of racial prejudice. Results received by these two types of measurement will be compared using statistical equivalence test with a confidence interval of at least 95%. Measurement data from conducted evaluation through questionnaires will be analyzed and for every participant will be defined expected numbers of therapeutic sessions in order to be achieved reducing of racism.
 - f. Study 2 – the goal of this study is the validation of serious games as an effective instrument for mitigating of the racial prejudice of individual persons. Participants in this study will be the same as in Study 1. It will be conducted with each participant with the module for mitigation of prejudice based on races and the number of game sessions will be as defined in Study 1 number of needed for his/her therapeutic sessions. At the end of the study, again, racial prejudice of participants will be measured and received results will be compared with expected results defined in Study 1 using statistical equivalence test with confidence interval at least 95%.
- 7 Analysis of results received by conduction of Study 1 and Study 2.

As a final result, the study will include a multidimensional framework for measuring of prejudice based on race through playing a serious video game, plus novel and more ecological approaches for measuring and mitigating prejudice based on race through game playing with inferring emotional state by applying both the face expression analysis and EDA (electrodermal activity) measurements.

4 DISCUSSION

The current study proposes to be developed a multidimensional framework for measuring of prejudice based on the race through playing a serious video game implemented with the APOGEE platform. This framework will allow being created serious games for measuring of racism and later it can be upgraded with other types of prejudice. Moreover, the proposal plans to be implemented novel and more ecological approaches for measuring and mitigating prejudice based on the race through game playing.

The APOGEE platform provides an opportunity for easy construction of a rich maze game from non-IT experts. It gives opportunity easily to be created different mini-games incorporated an appropriate game scenario and this game scenario can be adaptable according to the current player characteristics. Therefore this platform will be used for implementing of SG for measuring and mitigating of prejudice based on race.

The first part of the maze will present the questionnaire for measuring the racial prejudice developed in phase 3 from the previous section. Each node of the maze will present a mini-game, created by means of puzzles and virtual players, and presenting a game scenario related to a question. These mini-games will substitute the standard questionnaires and tasks used for measuring racial prejudice.

Then, the second part of the labyrinth will implement a racial prejudice mitigation strategy. In this part depending on the received measurement results from the previous step will be available to be open these doors that lead to halls containing appropriate game scenario for prejudice mitigation. Hereby, the maze game will provide an easier accessible way for prejudices measuring and its mitigation independently of each one person without any intervention by psychologists.

The proposed approach allows substituting standard instruments for measurement and reduction of prejudice in terms of racism with a novel more ecological way. Fig. 1 provides a mind map of the proposed study. This approach will provide a possibility a lot of time and resources to be saved. Moreover, the process of measuring and mitigating of racial prejudice will be accessible from anyone and from anywhere.

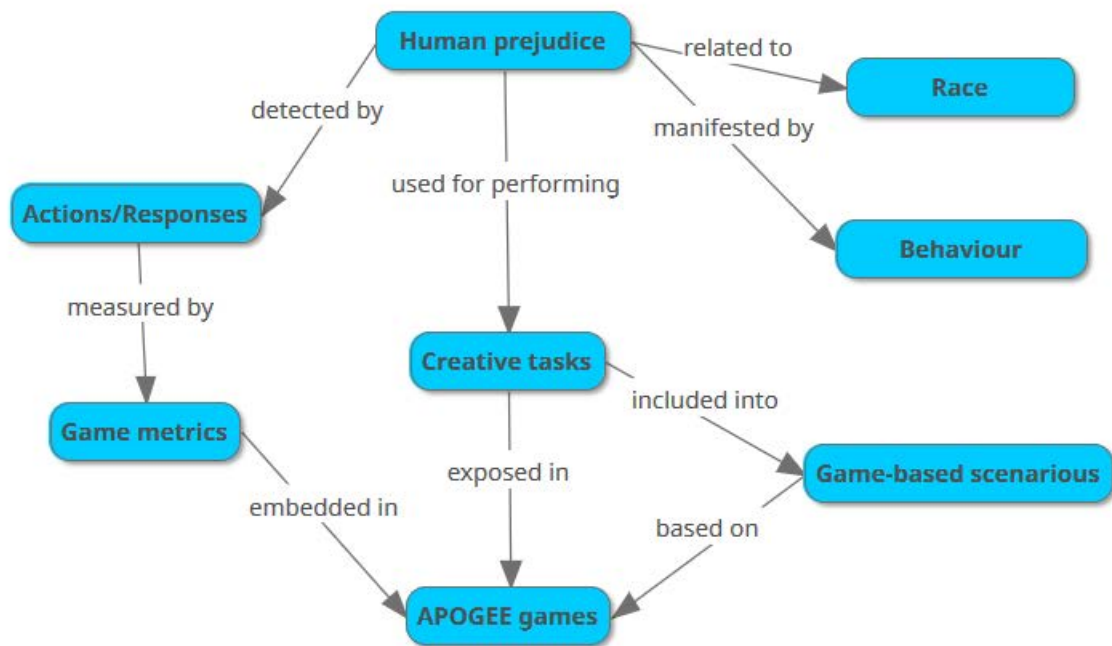


Figure 1. A mind map of the proposed study.

5 CONCLUSIONS

Today, racial prejudices are still widespread in contemporary society. It leads to the emergence of preconditions for inter-ethnic and inter-racial conflicts. Hence, it is very important to have a tool for measuring and reducing prejudices based on the race of an individual person in an easily accessible, effective and ecological way. This paper proposes a novel and ecological approach for this social problem, using a rich maze video game with embedded personalized puzzles appropriate for a particular player.

The current study plan to conduct a comparative critical analysis of existing instruments, models and frameworks for measuring racial prejudice, as well as to investigate what part of them and how they can be adapted and applied in a serious video game. As a final result of this analyses and investigation, there will be enabled to be created new instruments and models for evaluation of racism through SG.

It will be designed a multidimensional framework of observable and quantifiable metrics of different types (responses of stimuli, answers of questionnaires, emotional state, physiological signals) for measuring of prejudice based on race, targeted especially to applications in video games. This framework will allow being created serious games for measuring of racism, as well as it can be upgraded with other types of prejudice.

The current work plans to design and implement an SG as a novel approach and an ecological way for measuring and mitigating prejudice based on race and, next, to validate with practical experiments the efficiency of this new instrument. This SG will allow questionnaires for measuring racial prejudice and psychological therapeutic sessions to be substituted with playing a 3D video game that increases the perception of persons for reality and then it will create a more ecological environment. Moreover, an SG will be easily accessible and also it will allow measurements and game sessions to be conducted independently of each one person without psychologist intervention.

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