

# Hero: A Fighting Mobile Game with Environmental Protection Theme

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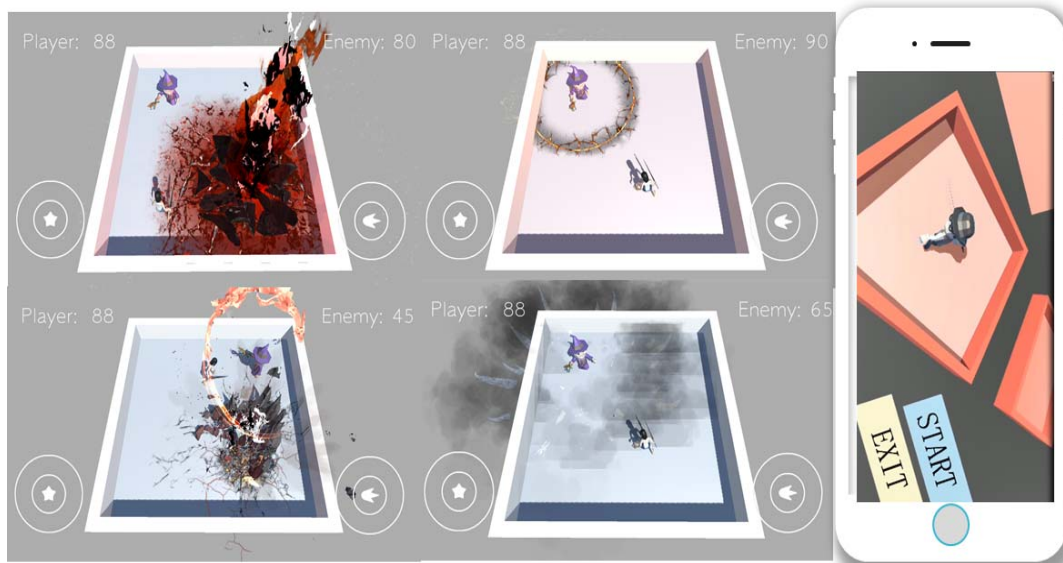


Fig. 1. Game screenshots.

**Abstract**—Industrialization and urbanization along with the economic development have led to increase in energy consumption and waste discharges. Pollution is continuously threatening human survival. Everyone is responsible for protecting the environment. In order to increase the attention of teenagers on environmental protection, we design and develop a fighting mobile game with environmental protection theme. The purpose is to let teenagers feel the importance of environmental protection, and learn some practical knowledge.

**Keywords**—mobile games, environmental protection, education

## I. PROBLEM STATEMENT

Environmental pollution has become a serious problem that threatens human survival<sup>[1]</sup>, and at least 9 million people worldwide die each year due to environmental pollution.

Environmental pollution has existed for centuries but only began to be significant since the 19<sup>th</sup> century along with the economic and society development. Without pollution control, the waste discharges from overconsumption, heating, transportation and other human activities will degrade the earth. Compared to the environmental governance, pollution prevention and waste minimization are more desirable<sup>[2]</sup>. Therefore, it is necessary to carry out environmental protection education for teenagers.

In order to cultivate young people's awareness of environmental protection, we researched various existing environmental protection publicity methods. The analysis shows that with the development of mobile Internet and the popularity of smart phones, China's mobile games have experienced rapid development, and the market size in 2017

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has increased by nearly 30 times compared to 2012. Mobile games refer to games that can be played on mobile devices such as mobile cellphone and iPad. People are more and more addicted to mobile devices due to the portability and interactivity of mobile devices.

For teenagers, mobile games are extremely attractive to them. For teenagers, most of them plod through textbooks without even being excited about what they are reading. They find the content dry and boring and would rather watch meaningless videos than study. Our game uses the characteristics of mobile games to combine the boring knowledge with it, so that the players can learn in the game and get pleasure in learning. In a relaxed atmosphere, the combination of games and environmental protection can not only convey the importance of environmental protection to teenagers but also teach them basic environmental protection behaviors, such as how to correctly classify garbage.

## II. OUR NOVELTIES

With the acceleration of the pace of life, many things are presented with the concept of fast food, such as fast food reading, fast food consumption and so on. Everyone's attitude towards the game also presents this trend. So in our game, we adopt the concept of fast food, that is, each game is very short, only about 2-3 minutes. Before players want to enter the next stage of the game, the system will provide users with some knowledge related to environmental pollution and protection, which appears in the form of pictures, words and short videos.

The main contribution of this article is to use mobile games as a medium of education so that teenagers can learn about environmental protection in the games. We hope that this game can make teenagers feel that as long as everyone works hard for environmental protection, everyone can be a hero to save the earth.

## III. SYSTEM ARCHITECTURE

The Hero game is based on unity platform, written in C# language, and runs on Android platform. In the game, particle effects and character models have been carefully optimized, so the configuration requirements are very low. The average Android phone can swim freely. The users can import demo.apk to Android phone and install it as required.

The game have three missions. In the first mission, every time users finish a game, they can learn what environmental pollution is in their lives and what prevention and control strategies are related to it. In the second one, users can feel the terrible results of the earth's environmental pollution in the game. In the third mission, we provide teenagers with basic knowledge of correct garbage classification and low-carbon life. Furthermore, the users are required to answer some single choice questions. Only when all the answers are correct, they can continue the fighting game.

In the game, users can choose avatars<sup>[3]</sup> according to their preferences. In monster selection level, the users can choose different monsters to challenge. Different monsters have different behavior mechanisms. After entering the battle, the left and right sides display the player's and monster's blood volume, with the maximum limit of 100. When it is reduced to 0, the game is over. The left lower corner rocker controls the character's movement, and the right lower corner controls the character's normal attack. The character needs to adjust position to avoid the enemy's attack and attack the opponent at the same time. There are three ways to attack monster pollution: laser attack with an attack interval of 1.5s; magic attack with attack interval of 2S; and instant self-protection magic.

## IV. TECHNICAL HIGHLIGHTS

The Hero game is a 2.5D mobile game, the main technical highlights includes:

- A fighting game developed based on behavior tree<sup>[4]</sup> and finite state machine
- Skeleton animation and animation state machine
- Skill effect and particle effect
- Different processes CG for different monsters
- Object-oriented coding
- Dynamic loading of game resources and asynchronous loading of scenes
- Third person perspective

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