

Multiplatform Game Type of Health Survey on Cancer Patient's Stress Level

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Abstract. Monitoring the changing condition of cancer patients is a significant part of their treatment. Stress coming from the patient's current situation may have a great effect on the spread of cancer cells. Thus, a cancer patient's stress level is a crucial factor for doctors to refer to when deciding for an appropriate treatment. In order to gather these data, "Distress Thermometer and Problem List" distributed by NCCN (National Comprehensive Cancer Network) is used globally, but the participation rate among patients is low. This is because the survey is very tedious and provides no feedback, which makes the patients feel like it is a waste of time. This game is made based on "Distress Thermometer and Problem List", and has entered in the 2016 Game4health competition in Utah, USA under the name of "Measure Your Stress Level". This game uses fun and cute animations to identify with the patient's situation and patients can participate in the survey in a more entertaining way. Also, at the end of the survey, a stress relieving game is provided as a package in order to make the survey more engaging. The game is based on a multiplatform game engine so it can be outputted to smartphone, website, exe file making the game accessible anywhere, at any time. Thus, it will be easier for the medical staff to gather more data in less time.

Keywords: Distress survey · Multiplatform game · Game design

1 Introduction

Cancer patients not only go through physical pain, but mental anguish as well. The mental anguish that patients go through, regardless of the reason, is called "distress". Cancer patient's distress symptoms may vary from everyday emotions such as sadness, fear, dilemma to morbid conditions that damage psychological and social functions such as depression, anxiety, panic, social isolation, existence crisis. Distress is known to affect the spread of cancer cells [1] and to figure out the reasons for distress, NCCN (National Comprehensive Cancer Network) distributed a globally approved survey called

“Distress Thermometer and Problem List” [2]. This survey contains many items related to possible stress situations the patients may be going through. However, the survey is made up of formal questions and provides no feedback at the end, which may be the reason why many patients do not participate in the survey. Thus, it is a tiring process for the doctors who regularly require surveys to be done, and the patients who have to participate in such surveys. “Measure Your Stress Level”, a multiplatform measurement game was made to induce the patients to participate in the survey more, and to offer the medical staff a more efficient data service (Fig. 1).



National
Comprehensive
Cancer
Network

NCCN Distress Thermometer for Patients

SCREENING TOOLS FOR MEASURING DISTRESS

Instructions: First please circle the number (0-10) that best describes how much distress you have been experiencing in the past week including today.

Extreme distress

10

9

8

7

6

5

4


3

2

1

0

No distress



Second, please indicate if any of the following has been a problem for you in the past week including today. Be sure to check YES or NO for each.

<p>YES NO Practical Problems</p> <p><input type="checkbox"/> Child care</p> <p><input type="checkbox"/> Housing</p> <p><input type="checkbox"/> Insurance/financial</p> <p><input type="checkbox"/> Transportation</p> <p><input type="checkbox"/> Work/school</p> <p><input type="checkbox"/> Treatment decisions</p> <p>Family Problems</p> <p><input type="checkbox"/> Dealing with children</p> <p><input type="checkbox"/> Dealing with partner</p> <p><input type="checkbox"/> Ability to have children</p> <p><input type="checkbox"/> Family health issues</p> <p>Emotional Problems</p> <p><input type="checkbox"/> Depression</p> <p><input type="checkbox"/> Fears</p> <p><input type="checkbox"/> Nervousness</p> <p><input type="checkbox"/> Sadness</p> <p><input type="checkbox"/> Worry</p> <p><input type="checkbox"/> Loss of interest in usual activities</p> <p><input type="checkbox"/> Spiritual/religious concerns</p> <p>Other Problems: _____</p>	<p>YES NO Physical Problems</p> <p><input type="checkbox"/> Appearance</p> <p><input type="checkbox"/> Bathing/dressing</p> <p><input type="checkbox"/> Breathing</p> <p><input type="checkbox"/> Changes in urination</p> <p><input type="checkbox"/> Constipation</p> <p><input type="checkbox"/> Diarrhea</p> <p><input type="checkbox"/> Eating</p> <p><input type="checkbox"/> Fatigue</p> <p><input type="checkbox"/> Feeling Swollen</p> <p><input type="checkbox"/> Fevers</p> <p><input type="checkbox"/> Getting around</p> <p><input type="checkbox"/> Indigestion</p> <p><input type="checkbox"/> Memory/concentration</p> <p><input type="checkbox"/> Mouth sores</p> <p><input type="checkbox"/> Nausea</p> <p><input type="checkbox"/> Nose dry/congested</p> <p><input type="checkbox"/> Pain</p> <p><input type="checkbox"/> Sexual</p> <p><input type="checkbox"/> Skin dry/itchy</p> <p><input type="checkbox"/> Sleep</p> <p><input type="checkbox"/> Substance abuse</p> <p><input type="checkbox"/> Tingling in hands/feet</p>
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The NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines) are a statement of evidence and consensus of the authors regarding the availability of currently accepted approaches to diagnosis, treatment, and care. The NCCN Guidelines are expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care or treatment. The National Comprehensive Cancer Network (NCCN) makes no representations or warranties of any kind regarding the content, use, or application, and disclaims any responsibility for the application or use in any way. The NCCN Guidelines are copyrighted by National Comprehensive Cancer Network. All rights reserved. The NCCN Guidelines and the illustrations herein may not be reproduced in any form without the express written permission of NCCN. 02/13

Fig. 1. Distress Thermometer and Problem List (Source: NCCN)

2 System Overview

2.1 Client-Server Model

This app is made by using a game engine called coco2d-js. Using the JavaScript properties, this engine supports cocos2d-html5 which is used for web app development and cococos2d-x which is used to develop native apps [3]. As a result, codes written in JavaScript can be outputted to web, iOS, android, exe file, resulting in a cross platform app.

The game is uploaded on a heroku server which is Paas (platform-as-a-service) base and provided to patients. After the game, the patient's data is saved by going through a server with a node.js based express module and is automatically saved on DB. The saved data is passed to another URL address through the server's router and there, it uses d3.js library to show the results using data visualization and is then offered to the medical staff (Fig. 2).

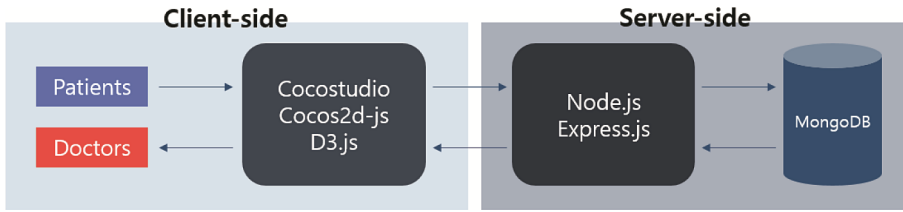


Fig. 2. App service model

2.2 Game Design

The game “Measure Your Stress Level” is the main game and comes with a bonus game called “Cancer Buster”, which is a stress-relieving game. The game’s overall structure is illustrated in the flowchart below (Fig. 3).

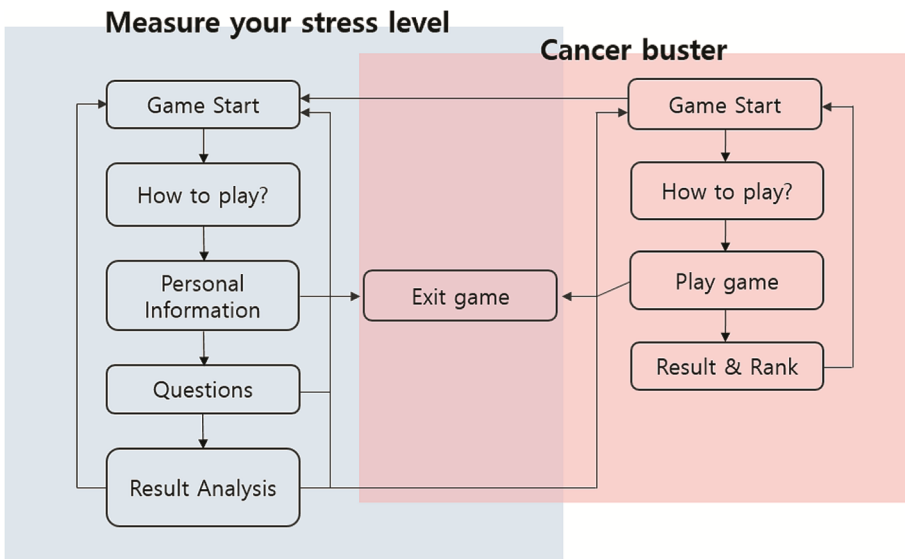


Fig. 3. Game flow chart

The Distress Thermometer and Problem List mentioned earlier is made up of 40 questions, and as it was a bit difficult to make one game scene for each question, the game uses 4 types of problem form to summarize the survey into 24 game scenes (Fig. 4).

In order to make the game less tedious, each question is made up of fun and cute images and a time limit is set so the survey can be processed more smoothly. If the time limit has passed, a doctor character shows up and asks if the player will end the game. Additionally, multiple sound effects are used to make the game livelier. After the game, the player’s stress level is shown as a result of the weighted sum of each question, and

the result is shown by indicating one of the 9 levels, where each level is represented to the user with a fun sprite image.

After the result is shown, the game asks the user if they will play the bonus game, Cancer Buster. Cancer buster is an arcade game and the goal is to protect the healthy cells from the cancer cells.



Fig. 4. Measure your stress level’s problem form



Fig. 5. Cancer buster’s game characters

The game scene is processed as illustrated in Fig. 6 - the cancer cells can be removed by using click and touch. The healthy cells that have survived from cancer cells turn into a growing cell, and if the growing cells develop into a certain size, it changes into an organ. This is counted as a game score, and the player that saves the most organs goes to the top rank. The organ characters are used in cooperation with the National Cancer Center [4], and the organs where cancer is likely to occur are used as the characters (Fig. 5).



Fig. 6. Cancer buster’s game scenes

As the game continues, the cells continue to grow with the ratio of growing cells at 10 %, cancer cells at 40 %, normal cells at 50 %, thus making the game harder. Also, physics engine is used to calculate the cell’s collision so the cell’s movement is more natural [5].

3 Conclusion and Development Plan

The project's main purpose was to gather data of cancer patients, so the game was designed to increase patient's participation. Multiplatform game engine was used to make the game more accessible to patients, and the game is easy to understand due to its simplicity and intuitive interface. Also, fun and cute characters and images, along with appropriate sound effects, and a bonus game for stress relief were used to reduce the wearisome process of the original survey. It is expected to offer great support to the medical staff who have to gather the patient's data on a daily basis. Currently, it is only a simple 2D game, but we are planning to develop it into a 3D game that can be played on a VR device. By doing this, we will focus more on the stressful situations that cancer patients go through.

Acknowledgment. This study was funded by a grant from the Korea Creative Content Agency (R2014040055).

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