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Review of Health Care Using Li Fi Techniques

Anurag, Sharanjit Singh
DEPARTMENT OF CSE
GNDU,REGIONAL CAMPUS
GURDASPUR

Abstract: Identifying the technologies which can solve the problems associated with health care will help to get rid of the numerous complications prevailing in this sector. The factors that impact the adoption of these technologies for elderly should also be considered as it will prove to be a precious aid in lifting the suffering from a variety of their problems such as living independently, Dementia, Prolonged and frequent medication.The proposed technique evaluates the applications of game theory in health care system. The analysis of progressive technology has been made including gaming education strategies for doctors and patients which is a great help.

Keywords: Health Care, Game Theory, Assistive Technologies, diseases.

I. INTRODUCTION

The population associated with world is the number of humans currently living disclosing the average death rate. As of August 2016, it was estimated at 7.4 billion. According to estimate of United Nation the population in 2100 rises to further 11.2 billion. The above data reveals we are transforming into an old planet which calls for immediate attention to the use of technologies which aid in making life easier. This shows the need of technologies that provide better care services to the older people. So in the health sector we have to come forward to resolve these health related problems in a short span of time. One of the strategies to analyze the health issues, behavior change and other related issues is the use of gaming theory. Gaming theory is defined as the theory of rational decision making, a set of concepts aimed at decision making in situations of competition and conflicts as well as of cooperation and interdependence under specified rules [1].

Health care at all levels local, regional, national and international has become an open issue characterized by distributed and shared decision making and management of care. It requires the communication of complex and diverse forms of information between clinical and other settings as well as coordination between groups of health care professionals with very different skills and role.

There should be a health care software system to work effectively in this environment. But this system also requires credible and timely information to ensure that software can work securely and produce results within specified time. Computer systems make the interaction between human and computational devices very natural so that users can get desired data in a transparent manner. The newly introduced gadgets like mobiles, PDAs, laptops etc. make every information available anywhere at any time.

By using game theory, interactive feedback loops and video games, we can analyze the health related behavior changes that may occur. Game theory has many applications and in long term it is viable to get fit into larger frameworks in health care. The increased influence of social media and online gaming on people has a significant impact on the health sector. Currently, we have many apps and games to manage the problems of patients to manage their diseases and track self management activity.

We have considered a personal health care emergency response system which incorporates health monitoring and human activity recognition. A health monitoring system is an intelligent environment that acquires and applies knowledge about the inhabitants and surroundings in order to serve a comfortable and efficient life to everybody.

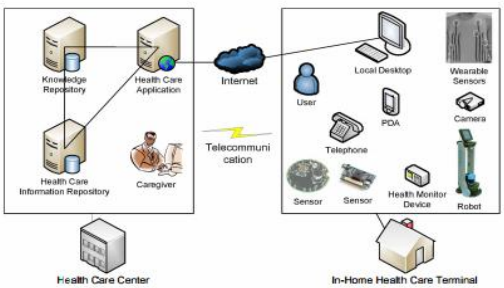

Fig: 1 System Structure for Health Care Monitoring and Emergency Response

II. THE SCIENCE BEHIND GAMING THEORY

According to researchers the gaming and use of technology can be a very effective tool in educating patients, engaging them in their own care, disease management and also motivating their behavior change. Some elements of game theory are decision making, goal setting and reaching helps in the improvement of patient motivation to a great extent.

Although, by using gaming theory we can have significant data which proves that the gaming increases patient's engagement and treatment adherence. With the help of gaming theory the patient can analyze his behavior and problems his self and take appropriate actions as per the need. It may be beneficial to incorporate a user's current health status and indicators into game for further motivating the individual.

III. RELATED WORK

In 1997, Marshal [2] defined assistive technology in the context of aiding elderly persons with disabilities as "any item, piece of equipment, product or system, whether acquired commercially, off-the-shelf, modified or customized, that is used to increase, maintain or improve functional capabilities of individuals with cognitive, physical or communication disabilities". Following this definition, The Royal Commission on Long Term Care [3] of UK, has defined assistive technologies as "an umbrella term for any device or system that allows an individual to perform a task they would otherwise be unable to do or increases the ease and safety with which the task can be performed". The above definitions have an obvious emphasize on disabilities in elderly persons. A more recent definition has been given by the Australian Dementia Resources Guide in 2008 [4]. This guide defines "assistive technologies as a product, equipment or device, usually electronic or mechanical in nature, which helps people with disabilities to maintain their independence or improve their quality of life". This definition has extended the use of assistive technologies from devices to help elderly persons with disabilities to products facilitating the seniors' daily lives. Our concept of assistive technology is most closely related to the Dementia Resources Guide definition, although we look at assistive technologies in a broader sense than only being used for dementia.

In recent years, there is an increasing necessity for tools and technologies that can assist the elderly in their daily living. The following are the two main arguments for this. First, seniors traditionally like to live independently and they prefer to live in their own homes [5], [6]. Second, it is a common belief that the healthcare system, particularly aged care section, will soon face a huge shortage in qualified carriers [7]. In addition, in remote and regional areas, even basic healthcare services require patients to travel long distances to get treatment and this is further exacerbated as the elderly often suffer from movement problems and cannot drive. Recent advancements in Information Technology (IT) have resulted in inexpensive off-the-shelf products that can have potential to assist older people in their daily life activities at their home [8].

The framework introduced by World Health Organization (WHO) [9] highlights the significant role of assistive technologies in the area of aged care. The report puts an emphasis on the acceptance of technology by seniors.

The literature suggests a look at the recent technologies that can be used in health care system and also identify some approaches to provide ease to the elderly people. This paper seeks answer to the following questions:

1. *What technologies have recently been used to assist elderly people in their daily living?*
2. *Which aspects of elderly people's daily life can be assisted by these technologies?*
3. *Which adoption theories best fit for accepting assistive technology by elderly people?*
4. *What are evidences for these theories, which impact the adoption of assistive technologies among elderly people?*

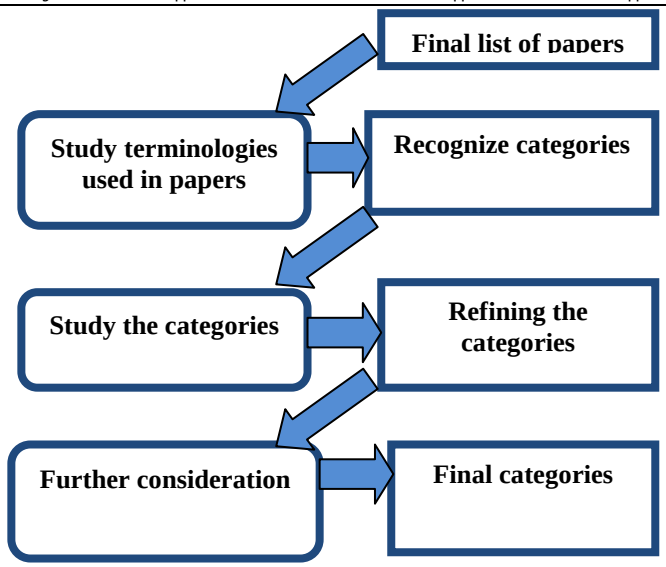

Fig: 2 Data Analysis Process for Q1, 2, 3 and 4

IV. USE OF HEALTH GAMING TECHNOLOGY

Some of the organizations and private companies researched, developed and implemented interactive games with the prime aim of improving patient health with some factors like self management, patient engagement etc.

Humana, one of the United States' largest health insurers hired "CobaltFlux" to develop "Dancetown", a game with the purpose of increasing physical activities among seniors. This company created its special innovative section for the development of these special kind of games. Similarly, National Institute of Health hired Archimage to develop "Escape from Diab", game whose prime purpose is to educate the children about the nutrition and diabetes. By using these games people can easily get aware about the food that is good for their health and exercises to avoid the diseases.

In the similar way, Kaiser Permanent developed a game called The Amazing Food Detective to educate healthy eating and nutrition tips to everyone. The Centers for Disease Control and Prevention uses a game called "WhyFlu" to impart the requirement and necessity of flu vaccination among children. Health insurer Cigna is partnering with a nonprofit to implement Re-Mission, a game to inculcate the knowledge in children about how cancer treatment works, how to deal with and its side effects so that they can handle it without any fear. Re-Mission was evaluated in a clinical trial at 34 hospitals and showed improved levels of engagement in treatment, treatment adherence, and knowledge of cancer treatment and side effects by players as compared with patients who did not use the game.

Med Star Health System developed a Web-based diabetes interactive platform for diabetic patients and conducts a pilot study to determine whether it would increase patient engagement in daily disease self-management activities. By using "eHealth2go" platform allowed patients to analyze daily blood glucose readings, track results and trends, and share results and communicate with care providers. In an early survey, the users of the platform were primarily found to be minority and elderly patients. This way, users experienced increase in e-health literacy levels. This project also received the 2011 Microsoft Innovation Award. MedStar recently released an updated version of eHealth2go that is targeted to
a wider audience than its original launch with some new features.

Gaming technology also improves patient mobility by providing the solution at single click without the restriction of time and place. To manage the chronic diseases, there are lots of Android and IOS apps for diabetes management, tracking daily glucose, analysis, medicine reminders as well as communicate with care provider as you need. 96% of these apps are specially designed for patients and 3.7% of apps are designed for both patients and care providers. Majority of patients fall in 50+ age group, hence, researchers are specifically interested in usability of the apps for elderly users.

The lack of integration among chronic disease management tools is a progressive area where cross continuum interactive patient care systems are emerging. Here number of tools integrated into patient portal as well as other health related information is added to provide better solutions to the users. Education, support information, tracking and interactive encounters are provided by using these systems [18].

Extensive research in the field of health care monitoring is being done. The personal emergency response system is one of the critical applications associated with health care. The In home health care system is an area to be explored which is discussed and successfully implemented using in home pervasive interaction based intelligent system .

The cyber system is another area which is utilized in most situations for the purpose of detecting health issues. The internet plays vital role in this situation. The proper lack of centralized ownership is explored in the field being analyzed. The biographical information is presented and stored within the database in this case. The most common diseases are then explored using the applications of cyber system [19].

Speech recognition can also be used in the detection of health issues and then presenting these detected issues to the administrator who can be a doctor in this case. The infant crying system is an area which is explored and discussed [20].

The health behavior change support system is created to support and resolve issues associated with health care. The assumptions made in this case regarding the change in behavior can be extensive or intensive in nature. The extensive change in the behavior indicates the disease within the body of human. These systems are persuasive systems. These systems can be used to suggest the lifestyle changes in case users are affected by CHRONIC diseases [21].

The game theory based approach can be used in order to reduce the overall costs associated with the detection and prevention of diseases in home based system. The system can be used in order to design scheduling system which checks the client health after a particular interval of time which is not random. Hence this system is active only after certain intervals, hence reduces cost [22].

The tabular structure associated with the cost associated with the health care system is described as follows:

Health Group	No. of Visit	Doctor IDs	Best Solution Cost	Solution Cost	Solution Payment	Initial Bidding
1	10	50	$307	$320	$345	$400
2	10	100	$270	$277	$305	$400
3	20	50	$607	$654	$720	$800
4	20	100	$599	$652	$690	$800
5	50	50	$1579	$1711	$1915	$2000
6	50	100	$1511	$1709	$1910	$2000
7	50	20	$1500	$1695	$1960	$2000
8	50	10	$1489	$1622	$1965	$2000

Table 1: Health Care Agency Payment At Different Group[23]

The cost is efficiently reduced by the use of persuasive system. The security is also required in order to ensure that data stored within the database is preserved against unauthorized access. Meta Heuristic models are preferred and utilized in this case. [24]

The following table shows the different theories with their significances.

THEORY	CONSTRUCT	MEASURED VARIABLES IN THE ARTICLE	SIGNIFICANT IMPACT Yes/No
Reasoned Action	Behavior	Level of Confidence in the use of technology	Yes
Diffusion of Involution	Compatibility	Compatible with most Health Care system	No
Planned Behavior	Subjective Norms	Making Technology Available as and when required	Yes
Unified Approach	Efforts	Describes effort required in order	Yes

		achieve desired goal	
Technology Acceptance Model	User Acceptance of Technology	Behavior Testing is performed	Yes
Social Technical Issues	Social Aspects are analyzed	Social aspects are checked for acceptance	Yes

Table 2: The comparison of various theories [24]

V. THE USE OF GAMING THEORY TO EDUCATE HEALTH CARE PROFESSIONALS

The use of gaming improves learning of health care system in a better way. With the help of computer science games and graphic toolkits the understanding of diseases are resolved at a large extent. The use of game theory includes safe learning environment, ability to simulate real life situations as well as opportunity of real-time feedback in an interactive manner. To educate the people, gaming is one of the best and most interactive methods which make everything easy to understand.'

VI. CONCLUSION AND FUTURE SCOPE

In this research paper to resolve the number of health issues which comes in our daily life, use of game theory has been analyzed. By using gaming theory, we can design a game which can examine the diseases of a patient in an interactive way. To analyze the problem we have to gather data from the users to detect the problem. As a future work, we can add human robot interaction to understand the human behavior, emotions, mental states etc.

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