Garden Mate: Guidance for new home gardeners to safe Green Environment

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The main facts in human life are birth, food, sleep, love and death, which is facing unawareness challenges on food in the present. Sri Lanka has food secure at national level, but the household level remains a significant concern. The accessibility of food depends on the income. The food security is also not ensured. As a result, people are affected by unknown diseases. Due to people have no interest in gardening and the production is not enough for the whole nation. More chemical fertilizers are used for quick sale and production of fruits and vegetables. Furthermore, the proposed project hopes to encourage the householders to do gardening through a computerized application with the use of image processing and 3D modeling. Since the proposed project mainly focused to increase the interest in gardening, when the numbers of gardens are increased the green environment will be safe for future generation.

Index terms- Image processing, 3D modeling, food security and gardening

I.   INTRODUCTION

Gardening is really an exercise which reduces the stress and gives many physical benefits. Studies show that just by looking at gardens or plants, blood pressure and stress can be reduced. If every householder does Gardening then the lower income people will also get nutritious vegetables and fruits at lower cost. Even though it has many advantages, householders have less interest in gardening as they are lack of knowledge of gardening. Through green environment the unknown diseases will be reduced and a healthy nation will be built. as everything is becoming computerized in this fast moving world, Garden Mate website is created to motivate the house holders in gardening by designing gardens for their home yard and proving all necessary information. Many valuable efforts have been put in increasing gardening. But still it remains the same.

RELATED WORK

Gardens ensure the green environments. Human beings cut trees for many purposes which harms the nature. Gardens have social, economic and health benefits such as reduce the global warming, healthy life and prevention from dangerous diseases etc. It increases the food security, vegetable consumption and availability of fresh and nutrition food even for lower income families [1]. Map documenting was done to identify whether the landscape is useful for gardening. J.R.Taylor and S.T.Lovell said that Insect survey, pollination and predation studies and the analysis of the chemical and physical properties of the soils will determine the effect of gardening [1]. Most of the tasks in all the fields are computerized. Gardening can be motivated through user friendly activities. A drag-and-drop interface is used to design the garden [2][3][6]. It saves time [2] and helps to change the shape of the garden and plants all the plants in the same family in the grow [2][3][4]. Users record their daily activities of gardening as offline or online journals in the software for future references [2][5][6][7].

User can view the garden as he is looking from eye level in My Kitchen Garden [7]. It views the garden as an intuitive graphical interface not as the top view and gives the 3D view of the garden. Garden Master system itself designs the garden with user's information. User has to modify the garden design as the system put the plants together that might not grow well together [8]. GrowVeg software locates the user's location and instructs them with suitable plants for the relevant seasons [3]. Farmville [9] is a social network game, where gamers can do online farming. Although this kind of application does not interact with real world gardening, they give a kind of motivation for people for gardening. Canada's plants hardiness zones revisited using modern climate interpolation techniques [10] is an example where IT and computer science has used to guide gardeners and adjust the garden according to the climate. Another benefit mentioned by the researchers by image processing and machine version techniques the user can feel the real images in the virtual environments. They used a procedural scripting language, Linden Scripting language is used to add interactivity to objects [11].

Smart Gardening (SG) is a virtual reality application for gardening. SG supports gardeners in making planting decisions. With increasing numbers of retired people in Japan and increasing interest in healthy eating, home gardening is becoming more and more popular. However, it is difficult for beginners to plan gardens because of

the wide range of factors to consider, such as soil, weather, climate, and pets. SG supports decisions about what to plant where with data collected by sensors organized in database. T.Okayama states that the concept of SG is based on precision agriculture, which uses information technology to bring together data from multiple sources to support decisions associated with crop production. SG uses computer models to forecasts the outcomes of management decision, and the technology of augmented reality to show the grower the predicted results, as grower feedback is critical [16].

II.   OUR APPROACH

Several researchers are done on gardening field in different way. Gardens are very important thing in the world to ensure the food security. Researchers did some manual tasks to motivate and increase the number of home food gardens. But those are risky that is the manual records might get lost and they have to visit each and every gardens to check the process and to guide them. It is time consuming also.

Then the researchers developed some desktop applications with drag-and-drop facility to design garden.
But Garden Mate will design the garden by itself on user input image and length and width of the real user's garden with 3D models of plants. It provides all necessary information relevant to gardening activities and all the instructions to succeed in gardening.

III.   METHODOLOGY

When considering the development pattern of our research, the project team has decided that Spiral model is suitable for the development of the system. Spiral Life Cycle Model is a sophisticated life cycle model that focuses on early identification and reduction of project risks. A spiral project starts on small scale, explores risks, makes a plan to handle the risks, and then decides whether to take the next step of the project – to do the next iteration of the spiral. Log in, create user profile, and add location, design garden, record daily tasks and set reminder are phases of this project. Each phase will be analyzed, designed, implemented and tested separately.

A. *Planning*

All functionalities and the process of the system according to the duration were clearly defined. The risks of the project were identified by feasibility analysis. Financial feasibility was performed in order to identify the budget for Garden Mate development whereas organizational feasibility was done to know how well the users will accept the system.
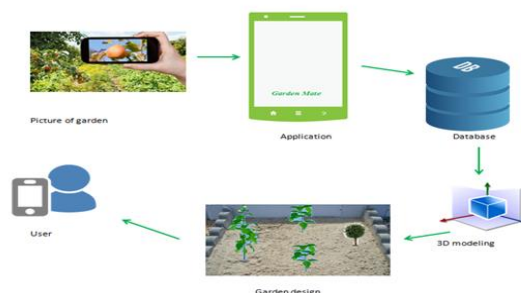
B. *Requirement Gathering*
Functional and non-functional requirements were defined and the primary data were gathered by the questionnaire from householders. By analyzing the primary data the project team identified the basic requirements for Garden Mate.
The secondary data were gathered from existing systems. By analyzing them as how they function, their advantages and disadvantages were known. Garden Mate will overcome all the prevailing problems in the existing systems.

C. *Designing*

This phase was used to design the system requirements. OpencvSharp is used for Image processing whereas Maya and Unity were used for 3D modeling. Given below is the high-level architecture diagram;

The user takes a picture of her home yard and uploads to the Garden Mate website. And also enters the exact height and weight of the garden. Then the image is saved and pixelated. Then the user is suggested to select suitable plants for his garden. Once the user selects the plants, 3D models of those plants will be retrieved from the database and displayed on the top of the image with relevant space in-between. Finally the 3D garden design will be displayed to the user.

When the user designs his garden according to the design given, he can start the session for gardening.

D. Implementation

Garden Mate was developed as a web application using asp.net Microsoft Visual studio, Unity, Xampp server and SQL server. Two techniques were used to design gardens. They are image processing and 3D modeling.

E. Image processing

Garden Mate gets an image of user's home yard as an approximate top view, length and width of their real garden as user inputs. Then pixelate the image and scale the pixels according to real world measurements.

F. 3D modeling

Garden Mate allows the users to select plants they wishes which are suitable to their location. Plants are created as 3D objects. Each and every plant needs some space around it to grow well. Spacing is added to the 3D objects as x and y axis. Then the processed image is loaded and plants are displayed on top of it.

IV. RESULTS AND DISCUSSION

The project goal is to provide a proper garden design and instructions to succeed in the gardening. As it is a simple website, user needs net connection and a web browser to use the website.

There were some problems faced by the development team. Placing 3D plants on top of the 2D image and the user input image can be of any type and any size. Connecting 3D with 2D is solved by creating a 3D plane in Unity and placing the 2D image on top of that 3D plane, and then it will be a 3D garden bed. Then the 3D plants can be placed on top of it and displays the garden design.

The development team assumed the user inputs garden image exactly from the top view as the below figure shows;

Figure 1: user input garden image from the top view

V. CONCLUSION

Currently the food security is at risk and household level food intakes are not significant. In this modern world percentage of green environment is being reduced. GardenMate will encourage and raise the interest to do gardening at home. Therefore they will have healthy and nutritious food at low cost. Food is the good medicine for human body. Home gardens will reduce unknown diseases as it gives physical exercise. All necessary information and instructions are provided to succeed in gardening. As the main objective, green environment will be saved for future generations by Garden Mate.

VI.   FUTURE WORK

The main limitation of the proposed system is, the project team is new to both image processing and 3D modeling techniques. Therefore the system is implemented as a website. The best way to attract people is through mobile applications. Therefore as a future work the project team is hoping to develop Garden Mate as a mobile application using Virtual reality techniques.

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REFERENCES

[1]   J.R.Taylor and S.T.Lovell, "Urban home food gardens in the Global North : research traditions and future directions", Department of Crop Science, University of Illinois Urbana -Champaign, Urbana, USA, December 2013

[2]   "Vegetable Garden Software Reviews", TopTenReviews.com, June 2011, [offline],Available: http://vegetable-garden-software-review.toptenreviews.com/plangarden-review

[3]   [Accessed: 20-02-2016 11:00]

[4]   "Vegetable Garden Software Reviews", TopTenReviews.com, June 2011, [offline],Available: http://vegetable-garden-software-review.toptenreviews.com/growVeg-review[Accessed: 20-02-2016 11:10]

[5]   "Vegetable Garden Software Reviews", TopTenReviews.com, June 2011, [offline],Available: http://vegetable-garden-software-review.toptenreviews.com/vegetable-garden-   planner-review [Accessed: 20-02-2016 11:20]

[6]   "Vegetable Garden Software Reviews", TopTenReviews.com, June 2011, [offline],Available: http://vegetable-garden-software-review.toptenreviews.com/garden-planner-review[Accessed: 20-02-2016 11:30]

[7]   "Vegetable Garden Software Reviews", TopTenReviews.com, June 2011, [offline],Available: http://vegetable-garden-software-review.toptenreviews.com/urban-garden-planner-review [Accessed: 20-02-2016 11:40]

[8]   "Vegetable Garden Software Reviews", TopTenReviews.com, June 2011, [offline],Available: http://vegetable-garden-software-review.toptenreviews.com/my-kitchen-garden-review [Accessed: 20-02-2016 11:50]

[9]   "Vegetable Garden Software Reviews", TopTenReviews.com, June 2011, [offline],Available: http://vegetable-garden-software-review.toptenreviews.com/garden-master-review.html [Accessed: 20-02-2016 12:00]

[10]   M.Balnaves, M.Willsonicating change and changing communication in the 21st Century", Australia, 2012, pp 1-12.

[11]   D.W.McKenney, M.F.Hutchinson, J.L.Kesteven and L.A.Venier, "Canada's plant   hardiness zones revisited using modern climate interpolation techniques" in "Canadian

[12]   Journal of plant science", 2001, pp. 129-143.

[13]   M.Vafadar,"Virtual Reality: Opportunities and Challenges",Department of Electronic,Iran, Vol 3, Issue 2, pp 1139-1145, March –April 2013.

[14]   R.S.Patkar,S.P.Singh and S.V.Birje, "Marker Based Augmented Reality Using AndroidOS",Vol 3, Issue 5, May 2013.