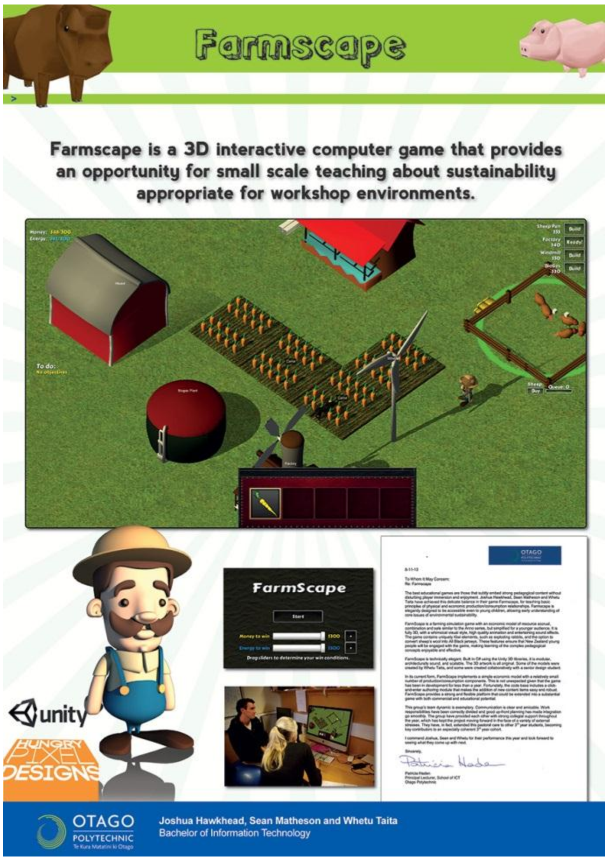
Farm Scape

Sean Matheson, Whetu Taita, Joshua Hawkhead
Bachelor of Information Technology
Otago Polytechnic

Paul Admiraal, Samuel Mann
College of Enterprise and Development
Otago Polytechnic
paul.admiraal@op.ac.nz, samuel.mann@op.ac.nz

ABSTRACT

In this paper we describe the development process of an educational computer game that seeks to encourage systems thinking by allowing players to set their own winning conditions.



Farmscape is a 3D interactive computer game that provides an opportunity for small scale teaching about sustainability appropriate for workshop environments.

Drag sliders to determine your win conditions.

8-11-13

To Whom It May Concern:
Re: Farmscape

The best educational games are those that subtly embed strong pedagogical content without disturbing player immersion and enjoyment. Joshua Hawkhead, Sean Matheson and Whetu Taita have achieved this delicate balance in their game Farmscape, for teaching basic principles of physical and economic production/consumption relationships. Farmscape is elegantly designed to be accessible even to young children, allowing early understanding of core issues of environmental sustainability.

FarmScape is a farming simulation game with an economic model of resource accrual, combination and sale similar to the Anno series, but simplified for a younger audience. It is fully 3D, with a whimsical visual style, high quality animation and entertaining sound effects. The game contains uniquely Kiwi elements, such as exploding rabbits, and the option to convert sheep's wool into All Black jerseys. These features ensure that New Zealand young people will be engaged with the game, making learning of the complex pedagogical concepts enjoyable and effective.

FarmScape is technically elegant. Built in C# using the Unity 3D libraries, it is modular, architecturally sound, and scalable. The 3D artwork is all original. Some of the models were created by Whetu Taita, and some were created collaboratively with a senior design student.

In its current form, FarmScape implements a simple economic model with a relatively small number of production/consumption components. This is not unexpected given that the game has been in development for less than a year. Fortunately, the code base includes a click-and-enter authoring module that makes the addition of new content items easy and robust. FarmScape provides a strong and flexible platform that could be extended into a substantial game with both commercial and educational potential.

This group's team dynamic is exemplary. Communication is clear and amicable. Work responsibilities have been correctly divided and good up-front planning has made integration go smoothly. The group have provided each other with strong collegial support throughout the year, which has kept the project moving forward in the face of a variety of external stresses. They have, in fact, extended this pastoral care to other 3rd year students, becoming key contributors to an especially coherent 3rd year cohort.

I commend Joshua, Sean and Whetu for their performance this year and look forward to seeing what they come up with next.

Sincerely,
Patricia Haden
Patricia Haden
Principal Lecturer, School of ICT
Otago Polytechnic

Joshua Hawkhead, Sean Matheson and Whetu Taita
Bachelor of Information Technology

Farmscape is a 3D interactive computer game that provides an opportunity for small scale teaching about sustainability appropriate for workshop environments.

The game mechanics are simple, the player selects the winning conditions at the beginning of the game which can be reviewed and changed by the player once goals are met or they run out of time. This technique allows the player to quickly identify how the parameters set in their initial configuration affect one another.

The current version of Farmscape is based on a prototype game developed in 2012. The original game features a simple buy/sell model where the main objective is to increase the amount of gold the player has.

Our original prototype game was developed in Visual C++ as a windows forms application, this platform is not optimal for game development and significantly limits options for expansion.

We determined that we needed to either rebuild the exact game in a different framework to be expanded upon or rebuild from scratch in a more suitable framework.

Computer games, especially those featuring rich 3D graphics, require a great deal of complex programming, even just a basic game world with some moving objects. Although different games vary hugely in genre, gameplay and size, many of the underlying structures, such as cameras, collision detection and physics are based on similar models.

It is for these reasons that computer games, especially those in the hobby/indie category will almost always require some kind of engine to handle the background mechanics that are not game specific. We selected the Unity framework as the development framework for development of Farmscape because it has greater flexibility for deploying on multiple device platforms.

The built in GUI tools in the Unity engine are fairly limited in functionality allowing only basic menus buttons and text. The look and feel of a game is an important aspect of the experience so we felt that we needed to have good quality graphics and animated text.

NGUI is a Unity add-on that simplifies the process of rendering quality GUI elements, such as pop up texts that fades upwards, animated transitions of numeric values and progress bars. With the use of NGUI we were able to produce a more polished immersive experience.

The first stable release of the game used basic un-textured models, which served to identify the purpose of the objects. This was the first build to implement our tile map feature, which aligned placement of structures to a grid (Figure 1).

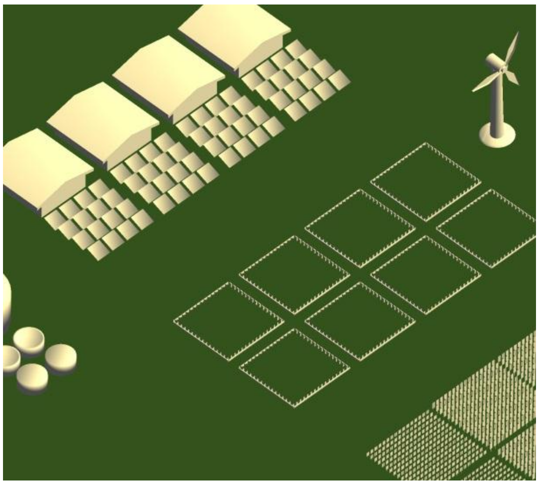


Figure 1: First stable release to use grid based tile map.

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We tested the user experience during the alpha stages of the game to observe how players were expecting to use the game (Figure 2).

We found that the controls did not appear logical to most people; the mouse clicks were the opposite of real time strategies.

A popular comment from test subjects regarding the inventory system was that they were expecting to be able to use it in the same way as *Minecraft*, a popular game played by our test demographic.

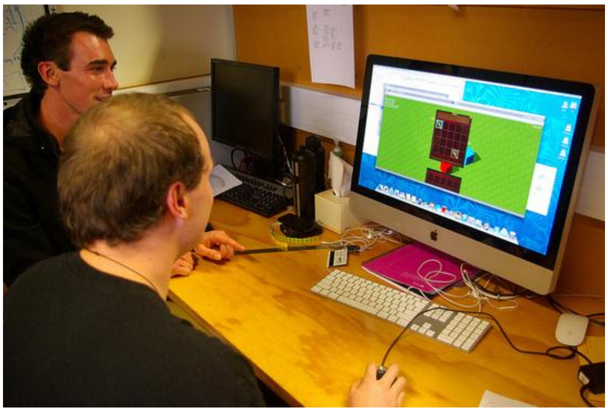

Figure 2: Test subject trialing the inventory system.

Of the game features originally planned, the final build does not include every feature listed.

See Table 1 for an analysis of the game features implemented.

Game Feature	**Basic Description**	**Implementation**
Biogas plant	Lowest energy producer consumes resources.	3D object generates energy when resources are used on it.
Windmill	Prone to breakdown, limited by wind availability.	Steadily increases energy units when one is owned.
Solar plant	Steady energy supply, varies slightly based on sunlight.	Not implemented.
Filtration plant	Reduces emissions, costs money to run.	Not implemented.
Storage	Resource/commodity inventory	Bag and Shed; the same model as World of Warcraft backpack and bank.
Emissions model	Increase and reduction in emissions based on objects in the game.	Emissions model not implemented.
Money	Balance deducted for purchases and tax payments. Credited for sales of resource and commodities.	Purchases as described. Tax functionality not implemented.
Mr. Sustainability	Third part character acts as in game hints.	Removed from game as no longer needed.
Wolf	Wild card, attacks animals randomly, killing them. May be scared off by farmer’s presence.	As described; though the farmer now shoots the wolf.
Market	Buying of resources (seeds), and buildings. Selling of resources and commodities.	Single building serves as gateway to market place.
Harvesting	Convert harvestable crops to inventory items.	Click harvestable field when in range to harvest the crop.
Crops	Corn, carrots and wheat.	As described. Crop additions are scalable so new crops can be added.
Animals	Sheep in pens that produce wool.	As described, wool sold to market.

Table 1: Game feature implementation.

Farmscape has been developed with extension in mind. We developed a system where new items can be added simply by adding an item to a database of objects, giving it a model, thumbnail price and parameters.

The different behavior models are independent of each other, so changes made to one area of the game do not affect the stability and robustness of other areas.

All visual elements of the game are modular and can be replaced or upgraded without affecting the mechanics at all, for example a new GUI skin could be applied with a completely different layout, and, the same data would still be represented. Additionally, any model can be replaced with another without affecting game play at all.

Farmscape is an interactive game that can be used a workshop teaching tool by encouraging players to think about think about the impacts they have upon the local and wider systems.

Systemic thinking engages learners to explore the connections within and between systems and emphasizes patterns and feedback loops; Farmscape meets this description with its feedback loop of setting win conditions, playing out the scenario until said conditions are met, then reevaluating and altering the win conditions to meet a different end goal.