MCO Details

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Details

CCPROG3 MCO Overview

MyFarm is a farming simulation game, where the player acts as the sole farmer (and manager) of their own farm. The gameplay typically involves the following tasks:

- Buying seeds,
- Preparing land,
- Planting seeds,
- Advancing days (err... watching crops grow), and
- Harvesting crops

There's obvious a lot more to the game, but that's the general idea. There's also no real end goal to this game – as in many simulation games. However, to make things clear, the game can theoretically go on forever and the player can continue to play for as long as they want except in the case when they (1) run out of seeds, (2) don't have any active/growing crops, and (3) don't have enough money to buy new seeds. The player also cannot continue if all the tiles in their farm lot contain withered crops (i.e. crops that died due to lack of care). When either situation happens, the game ends and the player is asked if they'd want to start a new game or simply exit the program.

The following sections goes into detail about how the game is expected to run while the end-game conditions have yet to be met.

Game on!

On the first day (i.e. day one) of the game, the player finds themself with the following:

- A ten (10) by five (5) farm lot,
- Zero (0) seeds,
- Five (5) units of fertilizer,
- One hundred (100) Objectcoins, and
- Farmer's level zero (0).

The Farming Process

The farm lot starts off with none of the tiles containing any crops and all of the tiles being unplowed. Seeds cannot be planted on unplowed tiles, so the player must first use a plowing tool to… plow a tile. Once a tile has been plowed, the player can properly plant a seed in that tile. Upon planting a seed in a plowed tile, the option to water and fertilize the specific tile/crop becomes available to the player. Watering and fertilizing are only available when a tile is plowed. Just like in real life, both water and fertilizer have some effect on a crop's growth. Without properly taking care of a crop, the crop will wither and stay on the tile forever. If the crop is able to successfully grow (i.e. enough time has passed and the minimum requirements of the crop have been met), then an option to harvest the crop should be available to the player. Harvesting a ready crop results in the player gaining *n* number of produce. Some crops produce only 1 product, while others may produce more. Regardless of the number, all produce from the harvested crop are immediately sold for a specific amount, which is credited to the player's Objectcoin wallet immediately. After harvesting a crop, the crop is removed from the tile and the tile reverts to an unplowed tile. Take note, a successfully grown crop must be harvested in the day it is ready. The player also gains some farming experience from successfully grown crops. Forgetting to harvest a crop (i.e. allowing a day to pass after the crop is ready) will result in the crop withering and the player losing any benefit from the harvest.

And that's the main grind! But as you've probably guessed, there's more to this game.

Oh no, Rocks!

While the farm lot starts of with no crops, there should be rocks that are scattered across the 10x5 lot. Rocks prevent any kind of player action from being performed on a tile (i.e. can't plow, so can't plant) – except for actually removing the rock. To remove the rock, a player must use the pickaxe tool which (*for some game-related reason*) costs 50 Objectcoins to use. Once a rock is removed from a tile, the player gains access to plowing the tile.

At this point, you might be wondering how many rocks are initially on the lot, as well as how they are scattered. Answer: the number of rocks and manner of scatter should be determined via file input. There is no specified format to the file, so feel free to design your own representation of the 10x5 lot and the initial rock scatter. This file should be read on the start of a game and there should be at least 10 rocks and at most 30 rocks. Assume the input file is always in a valid format.

Withering Away…

Whenever a crop withers, it stays on its tile *forever*... unless you have a little bit of money. When a tile has a withered crop, the option to use the shovel tool becomes available. Hence, a player can use the shovel tool to remove a tile's withered crop, but (*for some other game-related reason*) it costs 7 Objectcoins. After removing the crop, the tile reverts to an unplowed tile.

Unlike the pickaxe tool, the shovel tool can be used outside of its intended purpose. If used on an unplowed tile, the tile remains unplowed and the player simply loses Objectcoins. If the shovel tool is used on a tile with a plant, the plant would be removed and the tile reverts to being unplowed. Additionally, the water and/or fertilizer status of the tile (if applied) is removed. The player also loses 7 Objectcoins for using the shovel in this scenario.

Farming XP

Every time the player successfully harvests a crop, they gain a specific amount of experience and after gaining enough experience, the player automatically levels up. On the start of the game, the player starts with zero (0) experience. This is why the player starts off at level zero (0). Each succeeding level is achieved by moving up 100 experience points. Take the following cases for reference:

- Experience: 0 Level: 0
- Experience: 40 Level: 0
- Experience: 99 Level: 0
- Experience: 100 Level: 1
- Experience: 199 Level: 1
- Experience: 201 Level: 2
- Experience: 500 Level: 5
- Experience: 1000 Level: 10

Once a player's level is high enough, they may choose to register themself. The player must explicitly choose to register as this isn't automatic. Registering as a farmer has an cost, but also brings benifits, such as earning more per harvest and spending less for purchases.

Farmers need to pay to register. Registered farmers enjoy additional benefits.

Farmer Type	Level Requirement	Earning/buying limits	Water/fertilizer bonus	Harvest time	Registration Fee
Farmer	0	+/- 0	+ 0	- 0%	n/a

Registered Farmer	10	+/- 2	+ 0	- 5%	200
Distinguished Farmer	15	+/- 3	+ 1	- 10%	250
Honorable Farmer	20	+/- 5	+ 2	- 15%	350

A player can earn OC by harvesting the product. This is done by plowing a unit of land, planting seed, and eventually harvesting once enough time has passed.

In order to achieve the different tasks needed in the game, a player has access to certain tools that are immediately available to the player, as described in the following table:

Tool	Function
Watering can	Waters a specific crop; Can dispense an infinite amount of water
Plow	Prepares a specific title for planting; Also removes withered plants (costs 2 OC to remove)
Pickaxe	Used for destroying rocks obstructing tiles
Fertilizer	Not actually a tool, but is bought in finite amounts and fertilizes a specific tile; Cannot be placed on a tile with a plant; Costs 10 OC; At the start of the game, the user originally has 5 units of fertilizer

The player must also be able to see the field for farming. The field has a dimension of 10 tiles by 5 tiles. A tile is originally an unplowed tile, where seeds cannot be planted. Using the plow turns it into a plowed tile, where seeds can be planted. Whether a seed has been planted or a crop has withered, the tile is considered occupied. Once a crop is ready for harvest, a product appears, but is only credited to the user upon selection.

After harvest, the plant is removed and the tile reverts to an unplowed tile. If a withered plant had been removed, the tile will revert to an unplowed tile. A majority of the tiles are clear of rocks, but there are a few tiles with rocks where a pickaxe is needed to clear them before plowing can be performed.

The player must also be able to see the different tools and seeds, like an inventory. There should also be an area that shows the status of selected objects. Selecting a tile should show information about the tile. Selecting a tool should show information about a tool and options it can do with it (e.g. selecting the plow brings up the option to plow a tile or remove a withered plant). Selecting a seed should show information about the seed and options whether to plant or to buy more.

Seeds available are classified as either Vegetable, Flower, or Fruit tree.

Different crop types have different amounts of needs– water or fertilizer. Each crop varies in terms of needs. The list of all seeds available in the game, as well as other important information, can be found in the following table:

SN	CT	HT	WN (bl)	FN (bl)	HC	PP	SC	BP
Turnip	Vegetable	1	1 (2)	0 (1)	1	1	5	6
Carrot	Vegetable	1.5	1 (2)	0 (1)	1	1-2	10	9
Tomato	Vegetable	2.5	3 (4)	1 (2)	1	1-3	20	15
Rose	Flower	1	1 (2)	0 (1)	2	1	5	5
Stargazer	Flower	2.5	2 (3)	0 (1)	2	1	10	9
Sunflower	Flower	3.5	2 (3)	1 (2)	2	1	20	19
Mango	Fruit tree	7	7 (7)	4 (4)	3	5 – 10	50	4
Apple	Fruit tree	7	7 (7)	5 (5)	3	7 – 10	55	3.5

Banana	Fruit tree	8	8 (8)	5 (5)	3	10 – 15	60	3.5

Legend:

SN – seed name

CT – crop type

HT – time to harvest in minutes

WN (bl) – water needed (bonus limit)

FN (bl) – Fertilizer needed (bonus limit)

HC – harvest cost

PP – number of products produced

SC – seed cost

BP – base selling cost per piece produced

*Each seed/crop/withered crop takes up 1 tile;

however, fruit trees cannot have other seeds/crops next to them

(must be clear of crops 1 tile from the center tile in all directions)

Once a crop's harvesting time has finished, a product will appear. If harvested within a minute from the time it appeared, the action will produce a number of products n, where n is the number of products produced stated in the table above. Somecrops produce only 1 product, while others may produce more. After which, the products are immediately sold and an amount is credited to the user's OC wallet. The actual selling price sp of an individual crop product can be computed as such

$$sp = flb + bp + wb + fb + cb,$$

where

flb is the farmer's level bonus,

bp is the base price, wb is the water bonus,

fb is the fertilizer bonus

cb is the crop bonus.

For flb, the actual value varies according to the farmer's level and is independent of the rest of the values. The water bonus is the actual number of times watered multiplied by quarter of the bp. Similarly, the fertilizer bonus is the actual number of times fertilizer was applied to the tile of the plant multiplied by half of the bp.

Both the wb and the fb should be capped by the bonus limit stated in the table above. As for cb, all crops except for flowers have no bonus (cp set to 0). For flowers, cb is set to 5% of the sum of the bp, wb, and fb.

Flowers have a bonus because they are pretty.

If a crop's water and fertilizer needs are not met by the time of their harvesting, then the crop withers and does not produce a product. Products disappear if they are left on the crop for more than 1 minute after they appear. The crop also withers in this case. The player must be alerted as to the success or failure of a harvest, how many crop products were produced, and how much profit was made, if any. A withered crop stays on the tile for a total amount of time equal to twice the amount of the crop's HT (time until harvesting).

The player should also have an option to pay 10% of the total amount of SC (seed cost) for the removal of a withered crop.This option should be done through the plow tool.

Create a file that will save the field and when the seeds were planted. (TO complete)

1. Instructions and Deliverables

Your task is to create an implementation of the MyFarm – Farming Simulator based on the description above. You are required to apply the object-oriented concepts learned. You are required to create and use methods and classes whenever possible. Make sure to use object-oriented concepts properly. No brute force solution.

This project is at most done in groups of 2.(A person may work alone.) A person cannot discuss or ask about design or implementation with other persons, with the exception of the teacher and his/her groupmate.

Copying other people's work or working in collaboration with other teams is not allowed and is punishable by a grade of 0.0 for the entire OBJECTP course. A discipline case may be filed with the Discipline Office. In short, do not risk it; the consequences are not worth the reward.

The above description of the program is the basic requirement. Any additional feature will be left to the creativity of the student. Bonus points would be awarded depending on the additional implemented features. These additional features could include new types of game elements, including new relationships/restrictions among the game elements. Depending on the scale of the new feature, additional points will be awarded to the team. However, make sure that all the minimum requirements are met first. If this is not the case then no additional points will be credited despite the additional features.

We would just like to emphasize that you DO NOT need to create your own sprites (background pictures, item/product pictures, etc.) for the game. You can just use what is available on the Internet and just include them into your project. If you wish to do so, we would also like to remind you to please cite where you got your sprites.

For MCO1, you will be required to submit the following:

1. Complete object-based UML class diagram of MyFarm via Canvas. You will also be submitting a declaration of original work signed by everyone in the group. This document may contain all your sources and citations. The following classes are expected to be present :
    1. Plants
    2. Tile
    3. Board
    4. Tools
    5. Farmer details - Money, Farmer Type
2. Woking Application with the following features :
    1. A player can plant a Turnip, Carrot, Rose or Stargazer.
    2. Show in the terminal the crops that can be planted
    3. A player should be able to use tools, Plow and Water

4. Harvest the produce
5. Increase Objectcoin based on the harvest's output
6. Decrease Objectcoin based on the seed and costs for planting

For MCO2, your group will be required to have applied appropriate object-oriented based concepts to design MyFarm.

You are to submit a complete MyFarm program with a graphical user interface following the MVC architecture. You will also be required to submit your final UML class diagram, declaration of original, Javadoc-generated documentation, and all source files (zipped). Again, submission of files will be via Canvas.

Do not forget to include internal documentation (comments) in your code. At the very least, there should be an introductory comment and a comment before every class and every method. This will be used later to generate the required External Documentation for your Machine Project. You may use an IDE or the command prompt command javadoc to create this documentation, but it must be PROPERLY constructed.

During the MP demo, it is expected that the program can be compiled successfully and will run. If the program does not run, a grade of 0 will be given. However, a running program with complete features may not necessarily get full credit, as implementation (i.e., code) will still be checked. All members of the group should also be present. The group should use the machine in the lab for the demo and should know how to generate the bytecode file and to run the said file in the command prompt. Apart from question-answer, it is possible that a demo problem be given to the group as part of the demo. A student or a group who is not present during the demo or who cannot answer questions regarding the design and implementation of the submitted project convincingly will incur a grade of 0