



Crafting Quest 2 Rulebook

AI-MAS Winter Olympics 2011

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Glossary

SDK - kit that is given to the participants to support the implementation of the Solutions for the Game

Framework - all the classes/libraries that are needed to run a Solution for the Game

Solution - code that adheres to the Specifications given in the SDK, and that, when executing within the proper context, plays according to the Rulebook

Scenario - a set of values for the parameters established at the beginning of the Game.

Solution Instance - a running Solution, including its internal state.

Game Instance - a running Scenario, including its internal state, that represents the progress of the Game.

Server - executable that creates a Game Instance, and to which Clients can connect.

Client - executable that creates a Solution Instance, connects to a Server, and submits the Solution's actions to the Server

Action - discrete event that alters the state of the Game.

Turn - the measuring unit used to clock game progress. A turn has an associated time limit of 1000ms during which a player can execute as many actions as possible given his game context constraints.



Game Concept

Introduction

This document describes the rules of Crafting Quest 2.

Crafting Quest 2 is a two player turn-based strategy game. The challenge of the game is to gather resources which let you craft long lost artifacts leading you to great riches.

Game overview

In Crafting Quest 2, there are 3 types of units for each player: the Crocodile, the Tasmanian devil (Devil for short) and the Fox. Each team has one unit of each type. Your task is to implement the behavior of the three agents in order to maximize the overall team score.

The actions of a unit are restricted by the amount of energy it has. Energy points cannot be shared between units, and the energy of each unit is replenished at the beginning of each turn. Each action has an associated energy requirement. One unit can only execute a certain action if its energy meets the action's requirements.

The team earns credit points by selling crafted objects. Units may use these points to buy blueprints and build defense towers. Credit points are shared between the team's units.

Goal of the game

The goal is to have as many credit points as possible by the end of the game.

The challenge of the game is to gather resources and buy blueprints used to craft objects. Crafted objects can then be sold to gain credit points. The team with the most credit points at the end of the game (after a specific number of turns) wins.

Game Components

Map

Map structure

The map has a rectangular shape, composed of square cells. For each map there is a minimum of 50 and a maximum of 100 cells, in both width and height. Cells are also given a specific terrain type. The map's layout is scenario dependent, meaning that the players will not know its characteristics in advance.

Terrain type

Map cells can be of the following types:

- Grass
- Sand
- Swamp
- Dirt
- Snow
- Water
- Deep Water
- Rock

These terrain types impose certain restrictions on unit movement, by increasing the movement energy cost or by preventing units from moving through some cells at all.

Units

There are 3 types of units for each team:

- the Crocodile
- the Devil
- the Fox.



Each of them has special abilities, meaning that they react differently to certain terrain types. Teams will have one unit of each type.

Units of different types can do the same activities, being restricted only by the terrain type. Dirt can only be passed by the Devil, snow by the Fox and water by the Crocodile.

Resources

Each game instance presents 12 types of resources that can be found either buried in map cells (not visible), or dropped on the surface (visible). Initially, all resources are buried.

Cells may contain any number of buried resources of any type (usually not more than three resource types in the same cell).

The resources will not be uniformly dispersed over the entire map. There will be some regions on the map abundant in a specific type of resource, and other regions may contain no resources at all. Resources will not appear over inaccessible terrain (rocky cells) or in the cells that contain Merchant Camps.

Resources are used for building objects and are not shared between units of the same team. Each resource has its unique name and type.

Strategic Resources

Merchant camps

Merchant Camps are strategic resources used to provide blueprints. The list of blueprints available in a Merchant Camp is given at request to any unit in the immediate vicinity (surrounding cells).

Units cannot move to a cell containing a Merchant Camp.

The system guarantees an even distribution of blueprints per merchant and of Merchant Camps per map. Therefore, no team will be able to gain an advantage due to their initial positioning.



Blueprints

Blueprints are recipes that provide knowledge about how objects are crafted. They are specified from the beginning of the game, but can be used for crafting objects only after they are bought. Blueprints are shared between units in the same team and can be used for as many times as wanted. A blueprint may specify several alternative methods (required ingredients) in which an artifact can be created.

Crafted objects (Artifacts)

Crafting artifacts is what the game is all about. Artifacts cannot be found buried in cells, they are created by the player. However, these objects can be found at the surface, if dropped there by other units. By selling them, units earn credit points. If, at the end of the game, one unit still has unsold artifacts, those will not be taken into account when calculating the score.

Artifacts cannot be shared between units in the same team.

Defense Towers

The defense towers may be used to protect regions with vast amount of resources from being exploited by the opponent. The tower has a 4-cell radius of action and an initial energy set to 250 points.

Game Rules

Map related rules

Map terrain types

Units can request to move in any direction, being restricted only by the type of terrain of the desired destination.

Terrain types restrictions:

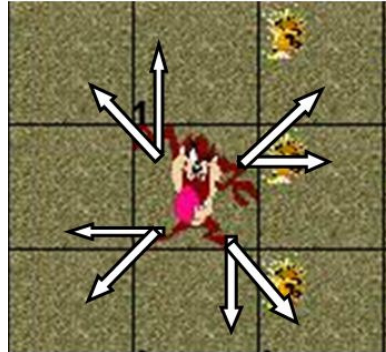
- Grass – allows any unit to pass through it. No additional movement cost is incurred.
- Sand – allows any unit to pass through it. Additional cost of 10% of base value incurred.
- Swamp – allows any unit to pass through it. Additional cost of 25% of base value incurred.
- Dirt – only the Devil can pass through it. Additional cost of 20% of base value incurred.
- Snow – only the Fox can pass through it. Additional cost of 25% of base value incurred.
- Water – only the Crocodile can pass through it. No additional movement cost incurred.
- Deep Water – only the Crocodile can pass through it. Additional cost of 10% of base value incurred.
- Rock – units cannot pass through this type of terrain.

Unit movement

Each cell of the map has two unique identifiers – the line number and the column number – each starting from 0.

• **Base value**

A unit can request to move in any cell adjacent to the one it is currently in. The moving action has an associated energy cost of 20 points.



- **Movements in the range of the opponent's towers**

When in range of one of the opponent's towers, the player's unit will also lose an amount of energy, which varies inversely with its distance from the defense tower, according to the formula: $60/\text{distance from the tower}$.

- **Strategic resources restrictions:**

Units cannot move to cells containing a defense tower.

Units cannot move to cells containing a merchant camp.

- **Carried resources/objects restrictions:**

An additional energy cost is required for each resource/object the unit carries with it: $(\text{resources} + \text{objects})/2$ energy points.

Unit view

Each unit can see all cells, regardless of their types, in all directions within a radius of maximum 5 cells from its current position.

For each cell the unit sees, it gains the following information:

- the cell's terrain type
- the visible resources it contains (dropped by other units)
- the crafted objects it contains (objects dropped by other units)
- the strategic resources present in the cell (Merchant Camp or Tower)
- the list of other units (friendly or adverse) present in that cell

This action has no associated energy cost.

Activities

Each unit is able to:

- Scan area
- Dig for resources
- Pick up and drop resources
- Craft objects
- Sell objects
- Buy blueprints
- Build a defense tower.

Units of different types can do the same activities, being restricted only by the terrain type.

Scanning

Each unit is equipped with a scanner which allows it to make an analysis of soil contents. When opting for a scan action the unit will obtain a list of soil attributes concerning the surroundings within the scanner's radius. This radius has a value of 7 cells. Soil attributes indicate the type of resources buried in particular cells.

Considering an initial set of attributes $\langle A1, A2, \dots, An \rangle$, the scanner will receive an association $\langle a1, a2, \dots, an \rangle$, for each buried resource contained in a particular cell. However, only a few of these attributes matter for the description of the resource.

For example:

$r1 = \langle A1=x, _, _, \dots, Ai=y, \dots, _ \rangle$, means that resources with attribute 1 having the value x and attribute i having the value y are always of type $r1$.

Also, the unit cannot know which set of attributes is assigned to which resource (the scan action and the dig action will return the resources in an arbitrary order).

A unit may not be able to make much sense of these attributes at first, but by employing smart learning techniques it will quickly be able to deduce the type of a resource within a cell. This can come to the unit's advantage, as the only other way to determine the resource contents of a distant cell is to travel to it and perform a digging operation.

The scanning action has an associated energy cost of 10 points.

Digging

When in a cell, the unit can opt to perform a digging action to discover what resources the cell contains. At this point, all resources in the cell become visible. The dig action has only an informational purpose. It does not add the resources to those carried by a unit, nor does it make the resources visible to other units.

The action is immediate and has an associated energy cost of 10 points.

Picking up resources/objects

A unit can choose to pick up any of the buried or visible resources/objects in the cell. Picking up buried resources is not preconditioned by digging for those resources to get information about their type and quantity (these may be determined in other ways such as cleverly using the scan operation).

A unit may execute this action only if the cell it wants to exploit does not lie within the range of an opponent's defense tower.

The unit must specify pairings of the form <resource type, quantity> / <object type, quantity> for the items it wants to pick up.

This action has an energy cost of 5 points (for the entire operation).

Dropping resources/objects

A unit may not be able to move if it carries too many resources / objects with it. Also it may want to make more room for some other types of resources. It can, therefore, choose to perform a drop action.

Similar to the pickup action, the unit must specify pairings of the form < type, quantity> for the items it wants to drop.

Once the resources / objects have been dropped, they will become visible to other units which come near to the cell. This means that any unit will be able to pick them up (unless there is a tower protecting them).

This action has no associated energy cost.

Selling objects

After having crafted an object the player can choose to sell it, or to keep it for later use (it can be used as a required ingredient for a more valuable object). Artifacts can be sold anywhere on the map. If the player decides to sell an artifact, its value will be added to the team's credit points.



The unit that makes the sale must specify a pairing of the form <object type, quantity> indicating the number of artifacts of type “object type” it wants to sell.

This action has no associated energy cost.

Crafting an object

Blueprints describe the way in which an object (artifact) can be built. This artifact can be crafted by:

- using resources (simple objects)
- combining other (previously created) artifacts (complex objects)

A bought blueprint can be used for as many times as it is needed.

The units must submit the type of the target object they want to build, and the list of pairings <resource type, quantity> / <object, quantity> which they want to use in order to build the new artifacts (since blueprints offers more than one possibility to build an object).

This action has no associated energy cost.

Buying a blueprint

A unit may choose to purchase one or several blueprints, once it is in the immediate vicinity of a Merchant Camp (any cell surrounding the Merchant Camp). The unit can access a list of blueprints that the merchant has to offer. One single merchant may not hold the entire list of blueprints, but the set of all the merchants on the game map is guaranteed to own them all.

Blueprints are bought using credit points (usually 50-120 credit points for blueprints of simple objects and 150-450 credit points for blueprints of complex objects). The credit gained by crafting an object using a blueprint is proportional to the cost of the blueprint (~4 times bigger for a simple object and about ~10 times bigger for complex objects).

If a unit has purchased a given blueprint, the item becomes available to the other units in the team as well.

This action has no associated energy cost.

Building a defense tower

When a unit encounters a region of the map with vast amount of resources, it can opt to build a defense tower to protect this region from being exploited by the adversary. The tower has a 4-cell radius of action and an initial energy set to 250 points.



The opponent's units will no longer be able to pickup objects or resources in the area guarded by a defense tower. Besides protecting the surrounding cells, the tower will also drain the energy levels of opponent units falling within its reach. However, while draining a unit's energy, the tower also gets weakened with the same amount of energy points it has drained. When the tower's energy level drops below 0, it will be destroyed.

Building a tower has no associated energy cost, but it does have an associated price of 75 credit points.

Unit energy levels

The unit's actions are restricted by the level of energy points it has. Every turn, the unit's energy levels are replenished to the value of 150 points.

Each action has an associated energy requirement. The unit can only execute a certain action if its energy level meets this action's requirements. Additionally, being in the vicinity of an adversary tower will cause the unit's energy levels to be drained.

Energy levels are meant to limit the number of actions performed during a turn.



Game progress

Setting up the Game

The game spans over a given number of rounds declared at the beginning.

Several other parameters of the game are scenario dependent: map dimensions, the number of game turns, the characteristics of the blueprints used (the resources/objects it uses and their number, the cost or the gain) and other parameters that are not visible to the client (such as map characteristics). An initialization procedure will provide the client application with all the required scenario dependent parameters.

Initial Game Status

All units will be placed on the map at the beginning of the game. The dimensions of the map will be available for all units at the beginning of the game, together with the number of turns.

The units will also receive a list of available blueprints.

It will be ensured that no team gains advantage over the other, concerning unit initial positioning.

Unit initial position

All units are placed on the map at a specific given position at the beginning of the game. The positions will be specified by the exact coordinates (row and column number of the cell) on the map.

Initial Team Credit

Each team is given an initial amount of 300 credit points. Credit points are shared between the units of the team.

Game turn

The game is turn based (played in an *I go, you go* fashion) and spans over a specific number of rounds given at the beginning of the game.

For each turn, a unit can do as many actions as it wants as long as it has enough energy. A turn has a given time limit of 1000ms during which the player can submit as many action requests as possible given



his current energy. The response to an action request is immediate within the player's turn time frame, and reveals the new state of the unit that made the action: the information in the neighboring cells and information referring to the unit. If a player makes an action request after his turn time has run out, that request will be taken into consideration in his next turn.

Also, the team will be able to get notifications about how many rounds are left and how much energy the towers built by the team still have. Once the time limit is out, the server automatically pauses the client and restarts it once the opponent's turn has ended.

There is no condition as to how many of the available energy points must be used during a turn. However, for each turn, the server automatically replenishes the unit's energy level to 150 points and no more, so the energy points which have not been used during a turn-time will be lost.

Game End

The game ends after a specific number of rounds, given at the beginning.



Game Score

The score of the game is represented by the credit points owned by a team at the end of the game. Crafted objects which have not been sold are not taken into account.

Each team is given an initial amount of 300 credit points which can be increased by units when selling crafted objects. The credit gained by crafting an object using a specific blueprint is proportional to the cost of the blueprint (about 4 times bigger for a simple object, and 10 times bigger for complex objects).