# MICORRIZAS

## DESIGN AND DEVELOPMENT OF A GEOLOCATED MOBILE VIDEO GAME TO PROMOTE KNOWLEDGE AND RELATIONSHIP WITH THE NATURAL ENVIRONMENT

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## ABSTRACT

This document presents the technical proposal for a Final Degree Project in the Degree in Design and Development of Video Games. The project aims to develop Micorrizas: Nature's Lost Legacy, an educational video game whose main objective is to promote knowledge of and engagement with the natural environment through active exploration and collaborative learning.

The design of the game is based on a real pedagogical activity carried out with university students of Early Childhood Education in the subject MI1815 - The Natural Environment in Early Childhood Education, which consists of a guided visit to the "Jardín de los Sentidos", an outdoor space at Jaume I University characterised by high biodiversity. This project is based on the transformation of that activity into a playful and interactive experience, using game design principles to encourage observation, discussion and reflection, while avoiding the mere digitalization of theoretical content.

The game will be a cooperative, location-based mobile game developed with Unity, incorporating geolocation and a lightweight multiplayer system based on a local host and cloud synchronization to support group decision-making and shared progress.

## KEYWORDS

Serious game - Mobile games - Cooperative gameplay - Experiential learning - Environmental education

## INTRODUCTION AND MOTIVATION OF THE WORK

The project consists of the design and development of 'Micorrizas', a cooperative educational video game for mobile devices, conceived as a serious game based on geolocation.

The game is designed to be played on site in the "Jardín de los Sentidos". The main objective of the project is to promote knowledge of the natural environment and the ability to use it as an educational resource. To this end, the design of the video game is based on a real educational activity taught in the MI1815 - The Natural Environment in Early Childhood Education course of the Early Childhood Education Degree at the Jaume I University (UJI).

Currently, the activity is carried out through traditional guided tours, which have certain limitations in terms of active student participation, as well as logistical constraints such as weather and schedules, and the availability of a trained instructor to lead the activity. Rather than simply digitising theoretical content, the video game uses narrative and mechanics based on exploration, observation and group decision-making to encourage active debate and reflection. This approach allows students to identify natural elements and understand how the environment can be used as a teaching resource.

Technically, the game will be developed using Unity for mobile devices and will feature a lightweight multiplayer system based on a local host and cloud synchronisation.

## RELATED SUBJECTS

- VJ1238 - Fundamentals for the Design of Educational Video Games
- VJ1220 - Databases
- VJ1222 - Video Game Concept Design
- VJ1208 - Programming II
- VJ2309 - 2D Design

## OBJECTIVES OF THE TFG

- To design a cooperative educational video game that promotes active learning through exploration and observation of a real environment.
- To develop a mobile game that reacts to the player's physical position within the Garden of the senses.
- Offer teachers of the subject in collaboration a valid and entertaining educational tool for independent activity.
- To provide an educational and entertaining tool to raise awareness of the environment and its biodiversity.

## TASK AND TIME PLANNING

TASK AND TIME PLANNING

| Task | Description | Estimated Hours |
|---|---|---|
| Project analysis | Study of the educational context and requirements | 10 |
| Game design | Definition of mechanics, narrative and gameplay loop | 50 |
| Technical design | Architecture and system planning | 30 |
| Art design | Design and draw assets | 10 |
| Development | Implementation in Unity | 100 |
| Multiplayer & geolocation | Integration of host-client and cloud sync | 40 |
| Testing and iteration | Debugging and design refinement | 30 |
| Documentation | Writing the final report | 20 |
| Presentation | Preparation of oral defense and materials | 10 |
| Total | | 300 |

## EXPECTED RESULTS

At the end of the project, the following results are expected:

- A functional prototype of a mobile educational video game to teach about the biodiversity of the sensory garden.
- A cooperative gameplay experience playable by small groups of students in a real outdoor environment.
- A system that integrates geolocation and shared game state synchronization.
- A documented evaluation of the system through quantitative/qualitative assessment by user testing

## TOOLS

TOOLS

| Tool | Description |
|---|---|
| Game engine | Unity (C#) and Visual Studio |
| Cloud data synchronization | backend ligero (Firebase/Supabase) |
| APIs y SDKs | Mapbox SDK (para mapas y geolocalización) |
| Art | Clip Studio |
| Version control | GitHub |
| Task and Time Planning | Excel and Trello |
| Documentation | Latex |

## REFERENCES

Pitarch García, R. (2012). Guia de la flora Ornamental de la Universitat Jaume I : Un campus per a la biodiversitat. Universitat Jaume I. Servei de Comunicació i Publicacions. https://lectura-unebook-es.eu1.proxy.openathens.net/viewer/9788480219457/2

# PERSONAJES PRINCIPALES Y CONTROLES

### PARTS

The `part` command generates a full-page heading with space for an image, as seen on the page before this one. Use the partimage command to set the image used on the page. Parts are also a good level to use the partcolor command to set the accent colour featured in many of the class's elements.

### CHAPTERS

The `chapter` command produces a large, accent-coloured, fancy title, such as the one on this page. Apart from its decoration, the chapter heading looks like the other section titles, set by the `segment` environment.

## SEGMENTS

The `segment` environment generates a two-column layout. This is an easier way than the `twocolumn` option to create a two-column document with many column-spanning elements, such as tables. Remember to end your segments. Otherwise, you will get error messages.

**With Heading:** Segments take an optional argument that generates a column-spanning `section` heading in green, as above. This is the main way to generate section headings, alternatively, you can also use the `section` command. In that case, be careful to place it outside any `segment` environment, or you will get an oddly placed, one-column title.

**Without Heading:** The optional argument can also be omitted to generate no heading, as after the table below.

### SUBSECTIONS

The `subsection` command generates the standard bold-faced, left-aligned heading you see above this paragraph. Use them to divide your longer texts into smaller chunks to provide a nice orientation for the reader.

### PARAGRAPHS

The smallest defined division in this document class is the `paragraph`. This command generated an inline bold heading that is best used for an unnumbered list of entries that are too long to put in an actual list environment.

**This is a Paragraph:** A nice way to use paragraphs is to add a colon at the end of the heading, as seen here.

**TABLEBOX**

| DICE | LABEL | ALIGNMENT | DESCRIPTION |
|---|---|---|---|
| 1 | Dice | Center (c) | If you want a table to be rollable, use the first column as the die or dice column. Give it a header denoting the die/dice used, and number the rows. |
| 2 | Label | Left (l) | The first or second column of a table should be the label of the entry. This gives a short and meaningful name to the entry in the row. |
| 3 | Score | Center (c) | You can add several narrower columns for short, standardized scores, such as price, availability, durability, etc. |
| 4 | Description | Left (L) | The typically last column in a table is a longer description of the entry. Use a breaking alignment for this, so the description can be more than one line. |

# BOXES

There are three types of box provided by this class: the Demonbox, Dragonbox and Emptybox. These are special environments that can be used to highlight special rules or important information in a compact way. These boxes are not floats but are placed as part of the text. Therefore, they can be placed both inside a `segment` environment, to produce a one-column wide box, or outside, to create a two-column spanning box.

### EMPTYBOX

This is an `emptybox`, it features the same heading as a `demonbox` but not the coloured background. It is used in the Tablebox environment but can also be used by itself.

### DRAGONBOX

✦ **These Rules Are:** Obligatory

This is a `dragonbox`, it can be used to highlight important information in a compact and noticeable way.

It can be used, for example, to typeset a Heroic Ability. In that case, you can use an `itemize` list, as above, to note the Willpower cost for the ability.

### DEMONBOX

✦ **These Rules Are:** Optional

This is a `demonbox`, they are used to add information about optional rules.

The `demonbox` is fully coloured in the current accent colour and can be a drain on printer toner or ink. It is generally a good approach to use these boxes sparingly. A restrained use of boxes in general also prevents the layout from looking cluttered.

### WIDE BOXES

Both `dragonbox` and `demonbox` can be used outside a `segment` environment to make it span the whole page width. When using text inside a wide box, it is good practice to use a `segment` environment inside the box to get a two column layout in the box and prevent overly long lines.

#### SUBSECTION

Lower level headings such as `subsection` and `paragraph` can be used inside boxes.

**Paragraph:** Using these headings can help make the text inside a box more ordered and provide a better overview.

# PACKAGE OPTIONS

## GENERIC OPTIONS

You can use all class options available to the standard `report` document class included in LaTeX.

**Papersize:** You can use the class with paper sizes other than A4, but be sure to keep the `textwidth` at 16cm, otherwise the headers will get uncentered.

## BLACK AND WHITE

You can use the `blackwhite` option in the `documentclass` command to generate the document in black and white colours. When doing so, you have to manually set monochrome images, the option cannot change included images.