

Appendix D

Stages of the Game

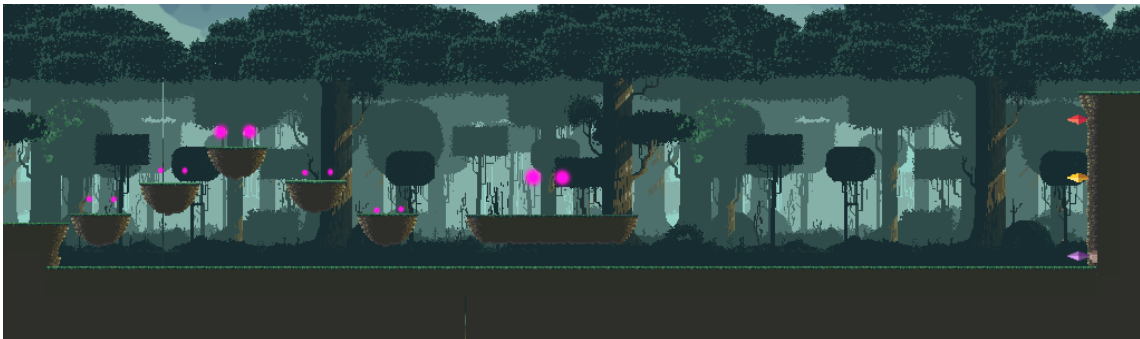
The *U-Forest* game consists of six stages graduated with difficulty maintaining a scaffolding process in dynamics and mechanics that exercise the use of the skills associated with CPS.

D.1 Stage 1: Tutorial

The first level seeks to lay the foundation for interaction with the system, to begin with collaborative work.

Figure D.1

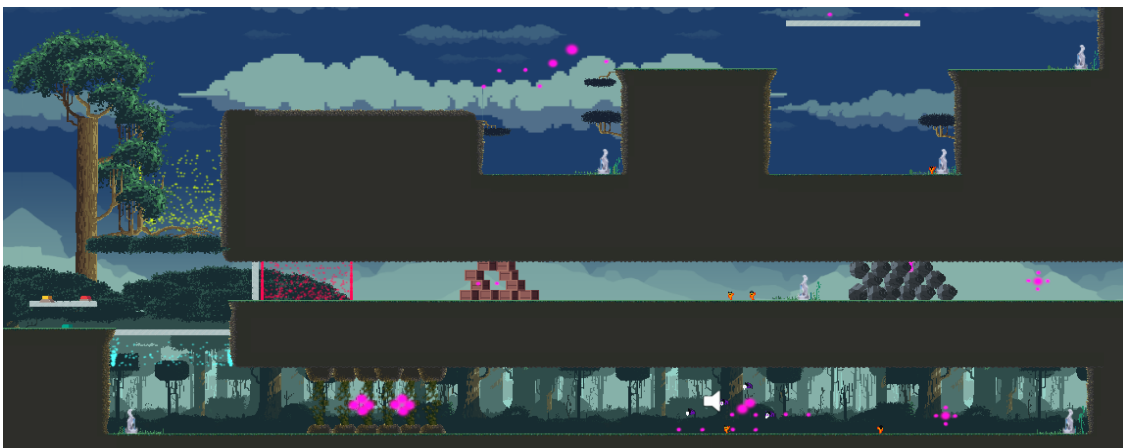
Home Stage Tutorial



This level is divided into two zones that the system displays as a single excellent task. The first zone is to explore the fundamental interactions common to all roles (Figure D.1). The second zone (Figure D.2) is to understand the particular mechanics for each role. A colour filter prevents other players from passing through. In this area, each player must use their special skill twice to advance to the end of the stage.

Figure D.2

Second Section Stage Tutorial



D.2 Stage 2: Recognizing Roles

The second level is articulated in two large sections. Task 1 through 5 (Figure D.3) ensures that all three players follow the commitments associated with their role and allow the necessary changes for the

progress of the rest of the team. In principle, two common tasks have been afforded. After this, each player follows a particular path (Figures D.4, D.5 & D.6) to perform tasks specific to their role within the game.

Figure D.3

Initial section Stage 2. Tasks 1-5

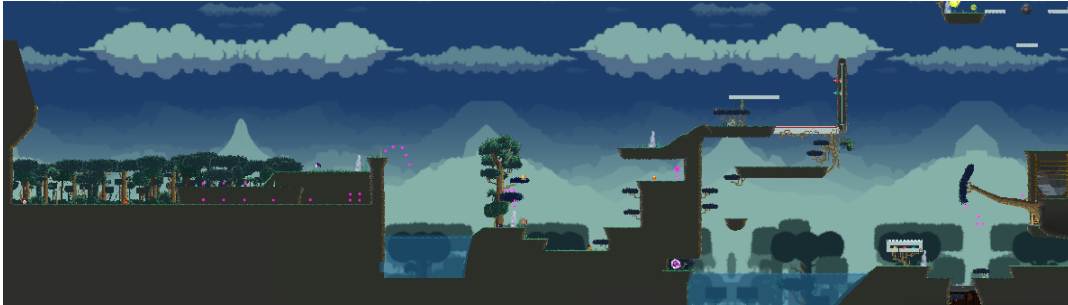


Figure D.4

Green player section. Tasks 6-7

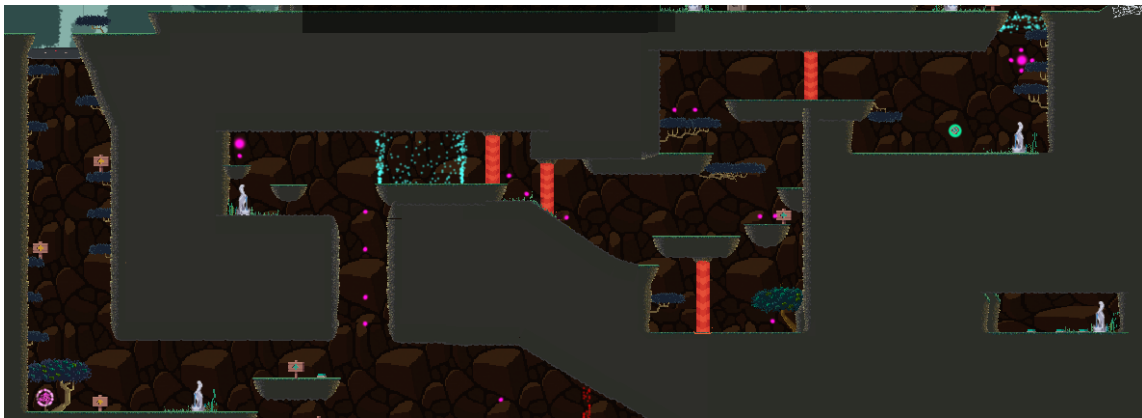


Figure D.5

Red player section. Tasks 6-7



Figure D.6

Yellow player section. Tasks 6-7



During the second section, between tasks 8 and 9 (Figure D.7), the system proves that students can solve a task that requires greater interdependence and synchrony in coordinating the three-team members. This task considers an increase in complexity concerning the variables that make up the users' collaborative dynamics. Organising and representing the problem clearly to generate a common action plan that is monitored becomes necessary in achieving the solution.

Figure D.7

Section 2 Stage 2. Tasks 8-9



D.3 Stage 3: Exchange perspectives and information relevant to the problem.

The third stage aims to enable players to exchange relevant information about the problem, exchange perspectives about the task's status to be resolved, and verify the essential roles and perspectives during the interaction. For this, the third level design proposes a zone where players recognise a new form of interaction with their skill and with their teammates: the use of magic zones and firing teleporters (see Appendix A).

The level is articulated in 3 large sections. The first section introduces new interaction mechanics both individually, collaboratively and remotely. The second section adds interdependence and synchrony factors to the mechanics presented during section one. The last section reviews a basic collaborative dynamic. To ensure that team members have complementary perspectives that they use in rebuilding the problem, players are in different play areas during the level. These areas require the effective and constant exchange of relevant information to overcome the task from the perspective of each member of the group.

D.4 Stage 4: Analysing possible problem-solving strategies

The fourth level seeks to ensure that the team can generate a common representation of the problem and weigh possible strategies. For this, a level with three sections is proposed (Figure D.8), of which it is necessary to overcome at least two to finish the level.

Figure D.8

Home Stage 4



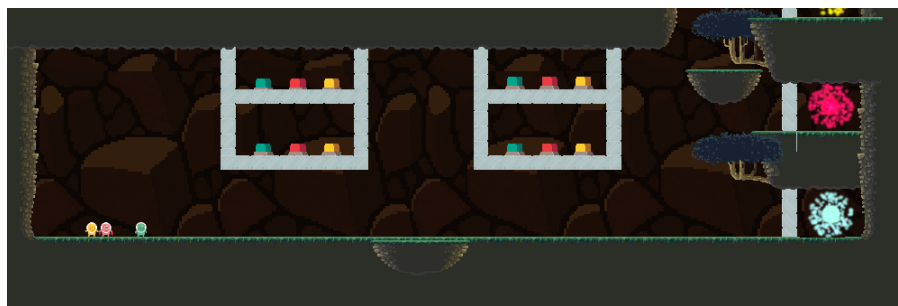
Each path has an equivalent level of difficulty with non-identical activities. At the end of these, players can find one of the four gears available to overcome the level; reaching two of these gears can now advance to the next stage.

D.5 Stage 5: Global task of multiple strategic solutions solved in consideration of the strengths and weaknesses of team members

The fifth level reinforces the skills worked on the previous level. However, this increases the possible paths and strategies to solve the stage. Players face six paths of increasing difficulty. Students know the character of incremental difficulty and can choose the most exciting and appropriate tasks according to their abilities as a team. In this way, users must activate four switches that become available as needed depending on the level achieved.

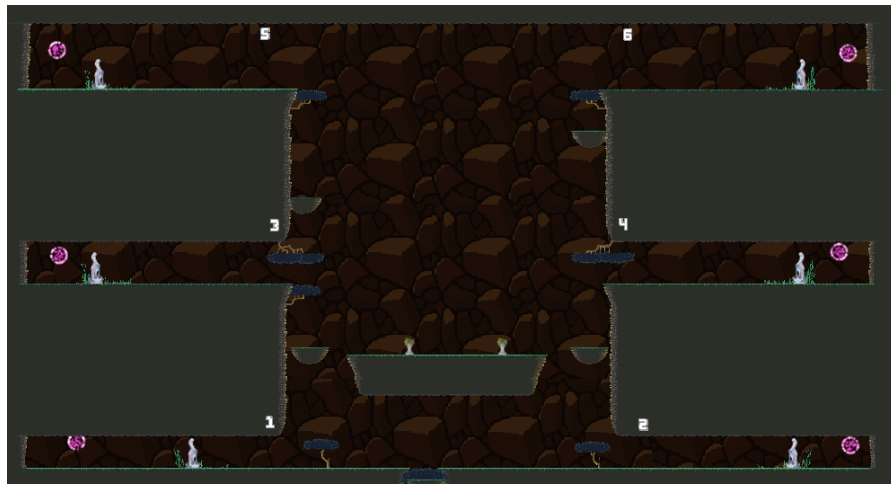
Figure D.9

Start stage 5



The central area of the stage consists of a large room with six corridors distributed upwards (Figure D.10). The NPC alerts players to the difficulty level of the area they are accessing. At the same time, it warns of the need to remain coordinated during the development of tasks.

Figure D.10
Stage 5 Central Zone



D.6 Stage 6: Global ill-defined task

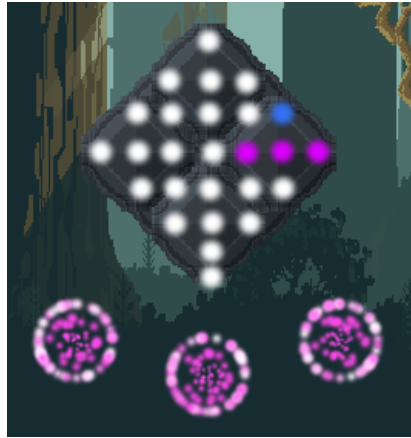
The sixth level seeks players to be able to create their ways to solve the problem. For this, the design proposes a level whose main mechanics and dynamics are formed through a maze in which players must meet and find solutions that allow them to reach the game's endpoint. Once the exit is found, the team can decide whether to finish the game or return to continue exploring possibilities within the zone.

Figure D.11
Panoramic Level 6. (Trimming)



Level 6 consists of 25 small sections organised as a diamond (Figure D.32). There are two maps within each of these sections and a group of between one or five teleporters that allow them to move through it (Figure D.12). The maps presented to the team allow them to visualise where they are and where they will go if they enter through that portal, using a rock with small lights representing the entire map. The blue light indicates the current section, and the purple section indicates the destinations of the portals. The only exception to this is the initial section, where players are divided by portals with particular destinations to each role and are represented by lights of each colour. In other zones, purple is a general rule because portals are accessible to all.

Figure D.12
Map location level 6.



There are five zones and a sixth switch-based mode that allow them to reach the end of the game. Each of these sections contains a different puzzle aligned with the complexity of level six tasks. Once the players reach one of the endings, they can decide to return to the puzzle where they can find a new challenge and ending for their own intrinsic motivation.