Game Design Document – Beaver Valley

Focus of the game

The game is a 3D puzzle game. The goal is to save the beavers' village from the water that comes from broken dams placed upstream the valley, by deflecting it thanks to wooden tables built by the beaver carpenter Woody, that have to be adequately placed. The water comes in the form of different rivers (many chunks): the water starts to come down when the corresponding timer put on the top of the screen expires.
There is a limited possible use of wood, in fact the trees in the valley may be used in two different ways: they can be either gnawed by Woody in order to realize wooden tables or used as supports for the wooden tables to redirect the water. Therefore the only possible ways to place the tables are either between a rock and a tree or between trees. In particular there are two different kinds of trees (weak, fresh), from which two different kinds of wooden bars (weak, fresh) can be got: a weak bar looks grey and breaks immediately after a chunk of water touches it; a fresh bar looks brown and never breaks.
When Woody is allowed to get a bar from a tree or to place a bar, a bulb appears above his head.
There are three different houses in the environment: the house of the common inhabitant, the house of the village's mayor and the house of Dorothy (Woody's girlfriend). A score is given according to the number and the kind of houses in the village that are saved at the end of the level: in order to complete the level a certain amount of score has to be got.

Game mechanics

The player can use the main character: the beaver Woody. He can:
– Move in all directions of the world;
– Gnaws the tree and build the wooden table;
– Place the wooden tables in order to deflect the water.

High level technical features

How does the world react to the user?
– After gnawing a tree, it disappears. Each tree produces one table.
– The water comes down from the dams. The water can hit:

- Wooden tables placed by Woody: in this case the flow is redirected according to the orientation of the the table.
- Rocks: like the tables;
- Houses: water destroys them;
- Trees: no deflection;

- After placing a weak bar, it holds until a water chunk touches it, then it breaks and disappears.
- The water is realized through ODE physics.

Game progression

The game progression consist of levels of increasing difficulty (more time pressure, more places from which the water comes, more chunks of water, different placement of items in environment).
According to player results, different cutscenes can be shown: either a cutscene depicting the happiness of the village for the good result of the player task (only at the end of the final level) or a different cutscene that shows the disaster on the village (at each game over).
For all levels different from the final one, when they are completed a screen text is showed to inform the player.

Game Elements
The main character in the game and the only physically visible is:
– Woody: the beaver carpenter;
In order to let the player feel the presence of village's inhabitants they are introduced some expression icons about:
– Dorothy: Woody's girlfriend;
– Mayor of the village;
These icons appear on the left side of the screen and they are accompanied by sounds.
The main items appearing in the environment and interacting with user's actions:
– trees;
– rocks;
– water;
– houses (may be of different size and kind);
– wooden tables (fresh, weak);
– dams.

Story
The story underlying the game is the story of a storm that hit the heights upstream a beavers' village. The dams on these heights are broken by lightnings and the water is coming down towards the village endangering it. The carpenter of the village, Woody, has to keep the safety by building wood channels to deflect the water far from the village.

Sound effects
The main elements that generate sounds are:
- Dams breaking;
- Woody's footsteps;
– Woody's gnawing;
- The reactions of Woody, Dorothy and Mayor to the results of Woody's actions;
- A sound to be played at level completion;
- Country-style background sound.
Beaver Valley contains 19 sounds in music, sound effects and voices and each of them has a particular aim:
- Music to create the environment: Country Soundtrack;
- Music to unify transitions : Level completed;
- Sound effects are contextual sound : Dam Broken;
Voices are informative: Dorothy screams when her house is broken, Woody's “Yeah” when he places bars.
Each sound is modified in Audacity(free sound editor) through:
- Cut & Paste;
- Smoothing;
- Fade In & Fade Out;
Moreover the frequency has been controlled to avoid distortions. The sound is introduced in Panda as 3D Audio.
The main sound sources are:
- Internet for music and sound effects.
- Voices registered.
- Woody Crunch using basic Foley: in this case a sheet of paper has been rolled up and it has been blown on.

Code design and trade-offs

Game code is completely based on the finite state machine paradigm and on the Panda FSM implementation. Every object of the puzzle is a finite state machine: Woody, Trees, Rocks, Houses, Water. Moreover some additional FSM are in place: Sound, Camera.

The game environment is a square matrix. Every FSM that composes the puzzle has an additional attribute to identify his position in the matrix:

+ Simple Game Level Design;
+ Future improvement may include a Level editor;
- Some constraints on the possible positions;
- Some problems on the exact coherence between the matrix coordinate and the Panda coordinate.

The matrix is used only for the level design. All the game interactions are based on the real coordinates.

About the environment: there are two different cameras. Camera Larger perspective provides:

+ Level understanding;
- User involvement with Woody;

The closer perspective provides:

+ Interaction with Woody;
- Level understanding.

Moreover the overall graphic look gave the impression of a too Static Environment. As a solution, shadows have been introduced.

The first version of the game underlines some problems regarding the Bar placement feature. Admissible positions for placing the Bar were also based on the matrix but matrix squares were too small: as a consequence the Player should have move Woody in the exact position where it was possible to place the Bar. This part of the Code Design has been completely changed in order to improve the gameplay.

In the final version admissible places for Bars are pre-computed: in each admissible place a FSM Bar is placed. The state of the FSM is initially “Off”. When Woody performs the place action, the corresponding Bar FSM change his state: the Bar is made visible by the FSM and collision solids are enabled. Admissible places are updated to adapt to the new situation.

The first release of the games showed that simulating the water using the matrix decreased the realism of the game. The company decided to introduce physics as a challenge to improve the game: Panda3d ODE library has been imported in the project and the water class FSM has been completely rewritten. Every water shoot is represented in the game as one ODE physics particle. The particles move around the environment following the ODE physics rules. Particles generates textures that fade out after a certain delay. This gives to the player the effect of a water flow. This choice combines realism and efficiency:

+ The gameplay achieves an incredible improvement;
- No unique level solution;
+ The code is much more clear and open to future improvements.

Why is it fun?

Beaver Valley covers the 3 categories of funativity. It is a 3D Puzzle game (Mental fun) with many action elements (Physical fun):

- Many water flows;
- Woody actions;
- Two kinds of wooden bars;
- Time pressure.

Moreover the story, the sounds, the characters and the environment involve emotionally the player (Social Fun).

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