

Chapter 16

Music Tutor Using Tower Defense Strategy

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ABSTRACT

Vivace is an online musical tower defense game using the tree-of-life metaphor, created using the Unity3D game engine. The game integrates basic music theory with the tower defense mechanic to motivate inspired learning. Vivace is different from most existing musical games, as it integrates notes and chords pedagogy in a puzzle-centric metaphor, as opposed to action/rhythm. This ensures that players undergo active learning by constantly applying and reiterating these musical concepts when tackling enemies and bosses through different levels. This article describes the procedural generation algorithms and game balancing strategies used to implement the game.

INTRODUCTION

Vivace uses the metaphor of a growing tree sapling that is battling pollutants and foreign organisms from reaching its “heart”. If the heart of the tree dies, then the tree itself withers. Flowers act as towers, protecting the heart of the tree from enemies. Each flower represents a different musical note which is played when the flowers fire defensive volleys at nearby enemies. These musical notes

attack and play cyclically, starting from the lowest point of the tree, allowing players to create a tune based on the type and location of planted flowers. The height of the tree is divided into regular intervals. Flowers grown in the same interval will be played at the same time, thus enabling the creation of chords.

Enemy agents serve as music teachers in disguise, as they motivate the player to place appropriate musical notes and build chords through the different game levels. Boss enemy agents do more damage to plants that do not contain correct

DOI: 10.4018/978-1-4666-1634-9.ch016

Figure 1. Screen shot of Vivace tower defense game



chords. Correct chords allow players to complete each level in an easier manner. The design blends well with casual games on a social web platform, so we allow players to share their completed game levels with other players. Since the flowers are musical notes, and the game state for any completed level plays out as a musical phrase, players can share their musical trees for peer rating. In addition to the rating system, we hope to emphasize community sharing, where players can vote for better songs and gain credits. Hence the motivational framework for the game is not only limited in-game, but also outside of it, in the form of song ratings and related bonus points that can be cashed out as in-game power-ups. (Danc, 2007)

In this article, we describe the motivation behind our game, the key aspects of the game design, mechanics and algorithms, design limitations and future extensions. The game can be played online at <http://games.comp.nus.edu.sg/chordtutor/>

WHY MUSIC AND TOWER DEFENSE?

Our preliminary brainstorming sessions were geared towards finding an appropriate game

genre for teaching music to beginners. Amongst the many possibilities, we considered using board games and turn-based strategy games, because these lend well to cognitive exercises. For the look and feel, we wanted something that would calm the mind and allow players to concentrate on the music pedagogy. Thus simple art aesthetics combined with plant nurturing became a natural choice. Most music games revolve around rhythm and timed matching of existing musical phrases. The fast-paced action usually diminishes the underlying pedagogical goals. Existing educational games on music theory lean towards traditional classroom styled lessons, which defeats the fun-potential of game design.

A music learning game naturally leads towards content creation and sharing. Seeing the popularity of *social* games and sandbox music composition games such as the *Isle of Tunes* (Isle of Tune, 2010), we decided to include a system in which players would be able to share and rate songs composed by other players. We felt that this would inculcate a sense of community sharing among players; that they are learning music together.

In addition to the music creation mechanics, we wanted to make the educational use of our game more prominent. To do this, we added a boss agent

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