Using Augmented Reality technology in, the form of a iPad based game for children, the project aims at creating an interactive experience enabling children visiting the Museum of Koldinghus to explore elements of the history of Koldinghus Castle

Koldinghus Augmented: The Walls Remember

Project description for development of an Augmented Reality interactive experience for Koldinghus Museum

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Version

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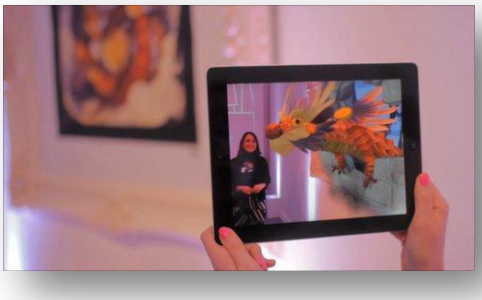
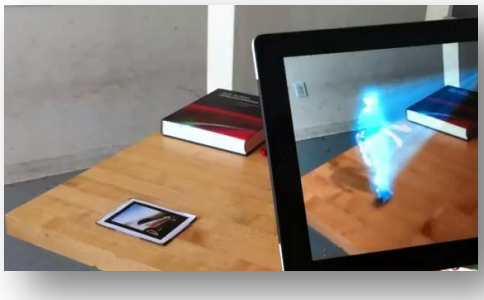
Introduction

The castle of Koldinghus in Kolding, Denmark, was totally destroyed by fire in 1808. The ruin is now partially reconstructed and serves as an active museum with exhibitions of artifacts from the local history and works of local silversmiths through the ages.

The project *Koldinghus Augmented: The Walls Remember* (Danish title: "Koldinghus: Murenes Minder") aims at developing an interactive experience for children visiting the museum. The core idea in the project is that children will be given an iPad and some game cards. On the iPad there will be an application (a game developed entirely for this project) which through a game-oriented narrative structure will guide the child through (parts of) the museum.





By following the narrative presented by the iPad app and by placing the game cards at selected locations throughout the museum, the child will experience various 3D animations and learn about elements of the history of the castle. The game will at several stages involve Augmented Reality, where 3D computer graphics elements are merged into a live video signal recorded by the iPad's built-in camera: see the above examples of iPad Augmented Reality.

Project Partners and Staffing

The project is called *Koldinghus Augmented: The Walls Remember (Murernes Minder)* and has two partners as listed in the collaboration agreement (Samarbejdsaftalen): Syddansk Turisme (Virksomheden) og Aalborg Universitet, ved Institut for Arkitektur, Design og Medieteknologi (ADMT/AAU).

The project manager at each partner is:

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At ADMT/AAU the following additional persons are allocated to the project:

Jacob Boesen Madsen, Research Assistant, working on project as technical coordinator and programmer

Peter Skotte, 3D modeller/animator

Project Description

The description in this document relates to the technical development of the iPad game app.

The game will entail a handful of “stations”, i.e., locations inside Koldinghus Castle, where the game player (the child) will be allowed to select which game card to employ, and depending on the choice, the child be experience a small 3D animation visually augmented onto the video feed from the iPad camera.

The purpose of the project described in the present document, the project which the collaboration agreement is concerned with, is to develop and implement the technical aspects of the described game experience.

End Product

The final deliverable, *the product,* to be handed over to *Virksomheden* at the end of the project is an interactive computer game based on the Unity game engine. This deliverable will be in the form of an app that can be installed and run on an iPad supplied by *Virksomheden*, or others. The app will be installable directly to the iPad from an ADMT/AAU computer, i.e., it will not be downloadable and installable through Apple’s AppStore.

The game app will constitute ADMT/AAU’s fulfillment of the collaboration agreement.

The complexity and level of functionality of the game app will be as described in this project description.

The development and description of the game play and the narrative is performed by third parties and is not covered by this agreement.

The design and production of 2D and 3D graphics elements (assets) to be used in the game is performed by third parties and is not covered by this agreement. This is also the case for 2D assets to be used outside the app, but in conjunction with the game experience, for example the mentioned game cards.

The production of audio assets to be used in the game is performed by third parties and is not covered by this agreement.

Game App Description

The present document describes the technical functionalities of the game app. The fully detailed game experience description, i.e. the game design document and manuscript, will be finished during the course of the project, and will be approved by both parties concerned with the present agreement, at a date approved by both parties.

The user will have a number of game cards, each with a unique appearance and designed specifically to work with the game app. At various locations around Koldinghus Castle there will be frames designed for holding such a game card. The frames also have unique appearances. At present it is imagined that there will be 6 such cards, and 5 frames. The final number of cards and frames in the game design is taken to be of that order of magnitude, and this indicates the projected game world complexity for the game to be developed under this agreement.

The game app, based on Unity and a plugin for Augmented Reality (either String or Qualcomm, a final choice to be made by ADMT/AAU) will be able to use the iPad's camera to recognize and respond to any combination of a game card placed in a frame, and to generate a relevant response to the recognition of such a combination. Examples of responses can be:

1. Playing a 2D graphics collage and a piece of audio introducing the narrative setting of the game (intro), or informing the user of the next step ("quest") in the game
2. Playing a 3D animation such that it is registered in 3D with the game card/frame in the physical world (in the manner generally accepted as constituting the concept of Augmented Reality). This will allow the user to explore the animation from a range of viewpoints by moving the iPad around while making sure the game card/frame combination is within full field of view of the iPad camera.
3. Through 2D graphics and audio assets to inform the user that the game card/frame combination is invalid and provide further instructions and/or clarifications.

All rules for game response to game card/frame combinations must be described in the design document agreed to by all parties.

In addition to the game card/frame combination responses listed above, the game app will be able to execute 2 mini-games. Examples of such mini-game could be the following, and this is indicative of the imagined level of ambition for those mini-games:

1. Allowing the user to, by touching pictures presented on the screen of various sized crystal glasses, to play a small melody segment (each glass has its own tone), and the game must recognize when the user has correctly played a melody segment which corresponds to a pre-played segment
2. Allowing the user to, by tilting the iPad, pour wine from a decanter into a glass

Work Plan

The work plan for carrying out the development of the described game app is sequential, with a number of milestones and/or deliverables:

- **September 6 to October 1, 2011: Pre-production**
  A game mock-up will be implemented to test the core functionality of all aspects of the full game. The mock-up will have a simple intro stage which shows a small number of (dummy/placeholder) 2D graphics screens as a temporal collage while simultaneously playing a (dummy/placeholder) audio segment; it will then be able to recognize a right and a wrong combination of a (dummy/placeholder) game card/frame combination and in the case of a right combination play a (dummy/placeholder) 3D animation registered to the frame, and in the case of a wrong combination it will use (dummy/placeholder) graphics and audio to inform the user of the problem. The mock-up will be a fully functional, stand-alone iPad app.
  Deliverable: internal demo of mock-up to all parties involved in the project

- **October 1 to October 8, 2011: Production of complete game-logic description**
  Based on the current version of the game design document produce and map down the entire game logic state machine, i.e., a 2D graphical illustration of what state the game enters given any conceivable event during the game (user actions, recognized game card/frame combinations, etc.).
  Deliverable: document describing the entire game state logic

- **October 8 to October 15, 2011: Production of complete asset list**
  Based on the mapped out game logic, produce a complete list of all required in-game assets (2D graphics, 3D models and animations, audio segments). The asset list must include a description of asset naming conventions.
  Deliverable: complete asset list distributed to all partners

- **October 15 to November 15, 2011: Development of β version game**
  Develop a working version of the entire game (although with only one mini-game), i.e., a version capable of handling all game card/frame combinations and any other event mapped out in the updated version of the game logic description (event triggers, flags, and logic).
  Deliverable: testable β version of the game to be demoed on-site at Koldinghus for all partners

- **November 15 to December 15, 2011: Development of deployment version game**
  Based on experiences from the β test polish the game app, including making adjustments to the game logic, and determining whether it is feasible to make any desired adjustments to in-game assets. Implement the last of the two mini-games. If time permits, design and implement various logging functionalities so as to enable data-mining aspects of users' use of the app (time spent on sub-quests, errors made in mini-games, etc.).
  Devirable: installed final game apps on a number of provided iPads for on-site testing and evaluation