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# CHRISTMAS TREE DECORATION

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AR Application



ISABEL FOTACHE K00338510  
VR, AR AND SPATIAL COMPUTING

## Concept

The AR Christmas Tree Decoration app is an application designed to bring an interactive, festive experience. The core idea of the app is to allow users to scan a physical marker, which triggers the appearance of a 3D Christmas Present in augmented reality.

The app is suited for environments where users can place the marker as a hanging ornament and watch a virtual present appear through their mobile device.

The primary objective of the app is to provide a fun AR experience, in which the user can easily scan the marker and enjoy the 3D decoration. The app is designed to be intuitive and easy to navigate. By combining augmented reality with simple interactions, the app aims to enhance the holiday spirit and demonstrate the potential of AR in applications.

## Design

The app features an on-screen Canvas with buttons that allow users to interact with the AR Christmas Present. Users can rotate the object, display a message on the screen and play festive music. The Canvas is designed to be responsive, using anchors and a Canvas Scaler to ensure that buttons remain appropriately sized across multiple mobile devices. Each button is placed in the corner of the screen to avoid blocking the view of the AR Present.

An important design decision was how to handle the orientation of the AR object relative to the marker. The marker is vertical, to mimic a printed image attached to a decoration, but the Christmas Present is intended to appear horizontally in the AR scene, in order for the object to be seen in the right position on the physical Christmas tree. To achieve this, the Present is placed as a child object with a rotation offset. Therefore, it lies horizontally while the marker remains vertical.

The object is a red and green 3D Present, which appears on the Christmas tree and has an appropriate size for a tree ornament. The QR code marker is also designed with a similar style and size.

Prototypes were created in Unity to test the placement, marker detection, and user interaction. Adjustments were made to the Canvas, button size, and rotation of the present based on these tests.

## Implementation

The app uses **image tracking** to detect the physical marker, which acts as a trigger for the AR content. The marker is stored in a Reference Image Library. When a marker is detected, the AR system spawns the 3D Christmas Present at the marker's location.

The app's interface is built on a **Canvas** in **Screen Space - Overlay** mode, with buttons anchored and scaled to fit multiple mobile screens. The Canvas Scaler is set to **Scale With Screen Size**. Buttons are designed with clear icons and text, and placed to avoid obstructing the AR Present, allowing users to interact with the object.

During development, several issues arose. Initially, the tree spawned vertically along with the marker, and the UI Canvas appeared too small on mobile devices. These problems were solved by implementing the child rotation offset for the object and adjusting the Canvas Scaler settings.

## Evaluation

The app was tested on an Android mobile device. The testing involved checking marker recognition, object orientation and the usability of the on-screen buttons.

Initially, the physical marker design lacked contrast, which made it difficult for the app to detect it. To solve this, the marker design was adjusted and the same QR code used for the project website became the physical marker. The QR code worked well, even when printed at a small ornament size.

The Canvas and buttons appeared too small on mobile screens, making the interaction difficult. Adjustments to the Canvas Scaler and button anchors resolved this problem. After these changes, the app allowed the user to view and interact with the Christmas Present through their phone.

## Reflection

Working on the AR Christmas Tree app taught me how important it is to test on real devices. While the app worked in Unity, testing on Android showed issues like the present spawning vertically and the Canvas appearing too small.

I also learned how much design decisions affect AR interactions. Designing a marker that could be easily detected was a real challenge and I had to consider how many elements it should have and the contrast needed to make sure it could be scanned. After creating my own Canvas and buttons, I had to learn how to scale them correctly so they would work on different device screens. I also became more aware of how 3D elements behave in real-world space and how their position affects the user experience.

Overall, this project helped me better understand the connection between design, technical implementation, and usability in AR.