Rajarshi Shahu
College of Engineering
Department of Computer Engineering

Preliminary Project Presentation

2011-12

BE Computer

AndArch

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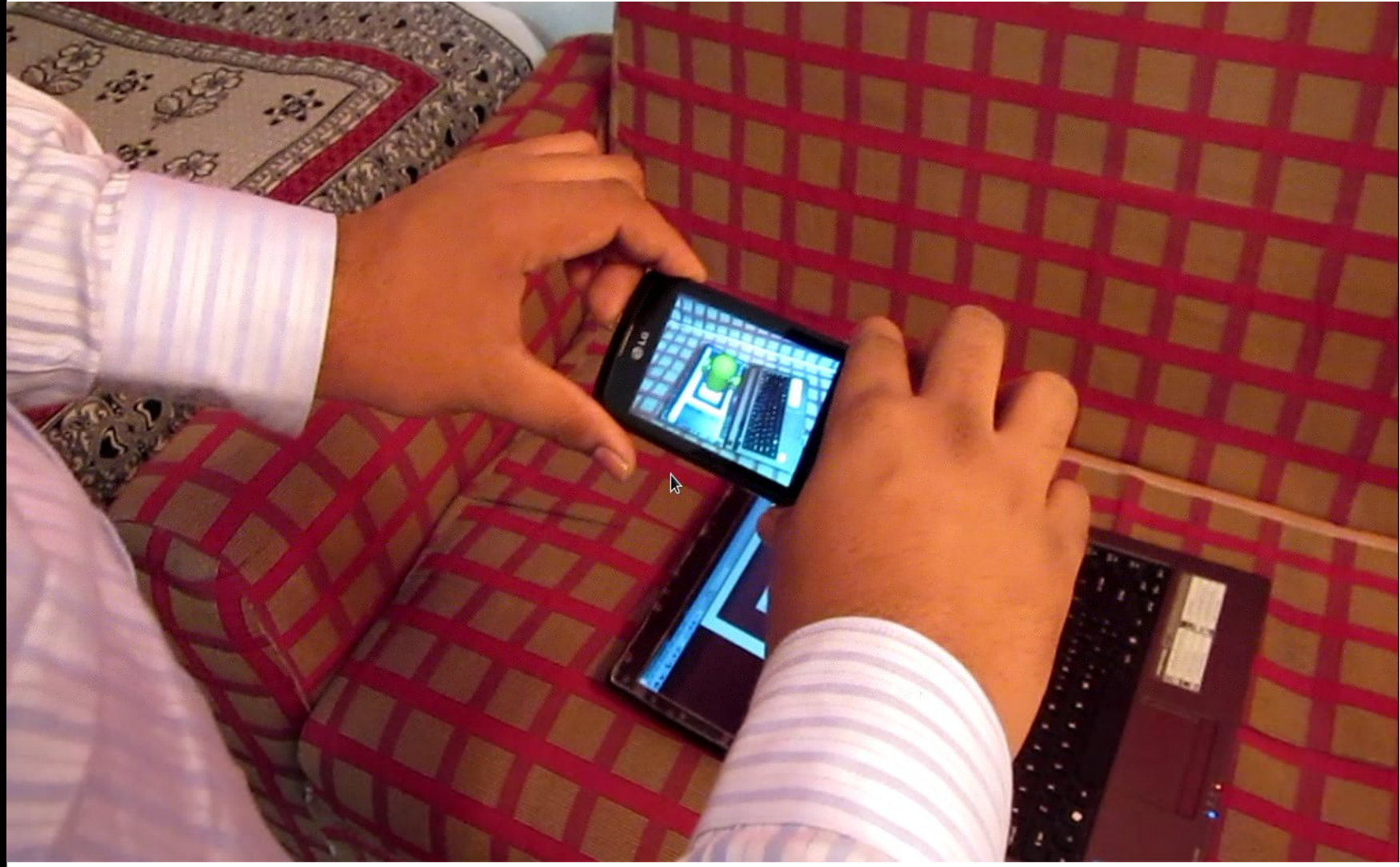
Guided by **Vaishali Barkade**

Introduction

Printouts

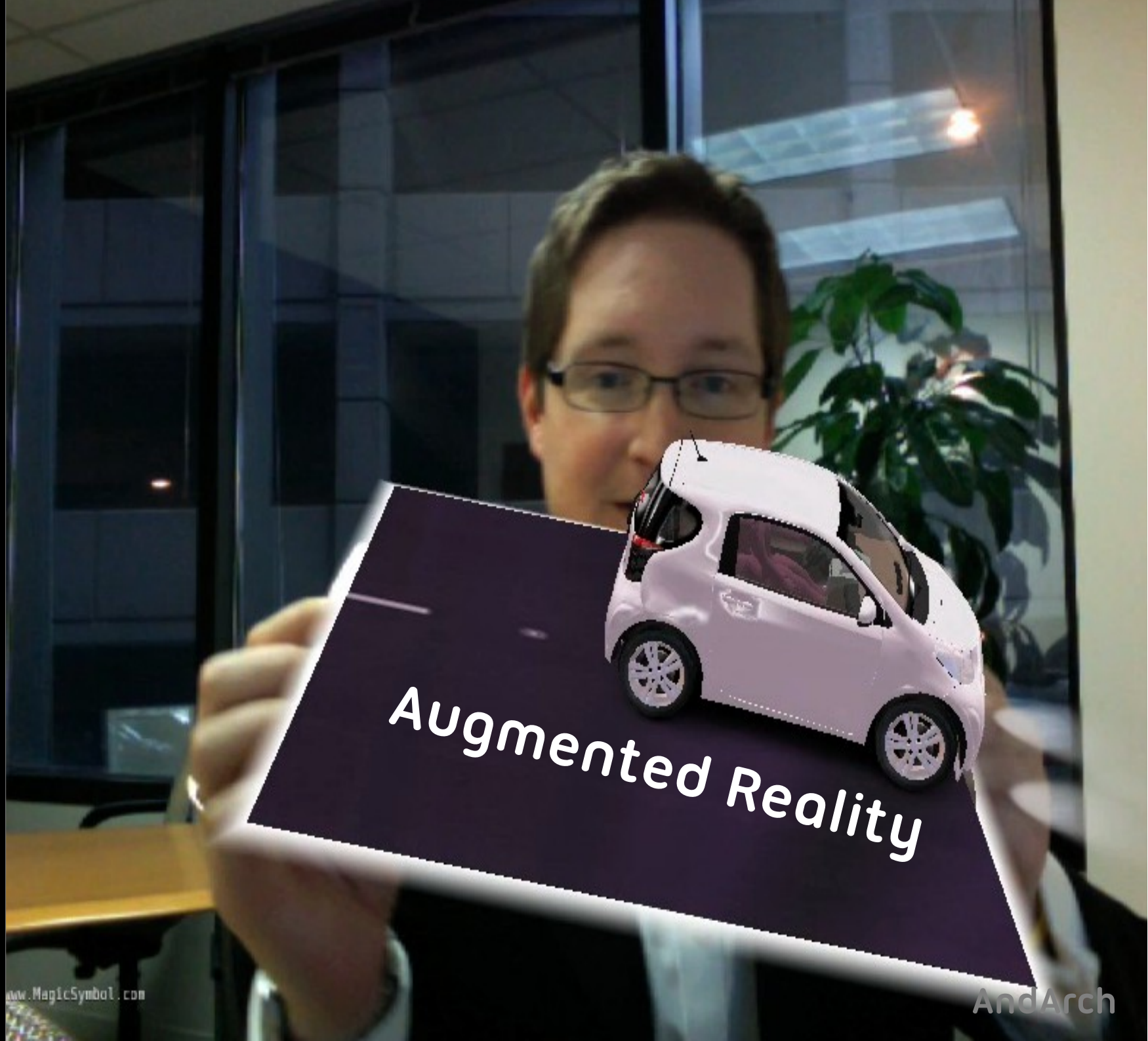
AndArch

Cardboard Models



Augmented Reality on Android

- Introduction
- Problem Statement
- Scope
- Literature Survey
- Requirement Analysis
- Proposed System
- System Design
- Mathematical Model
- Papers
- References



Problem Statement

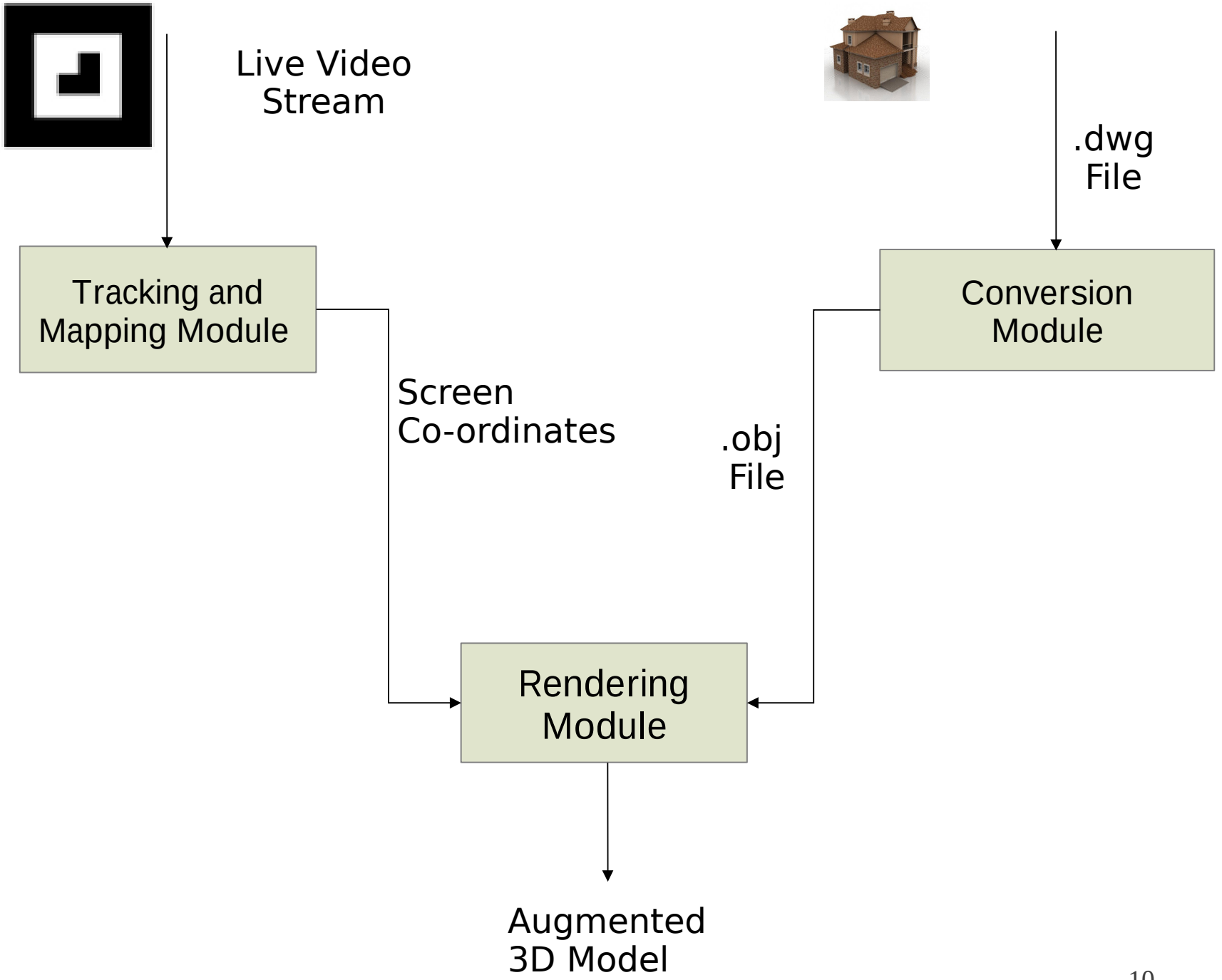
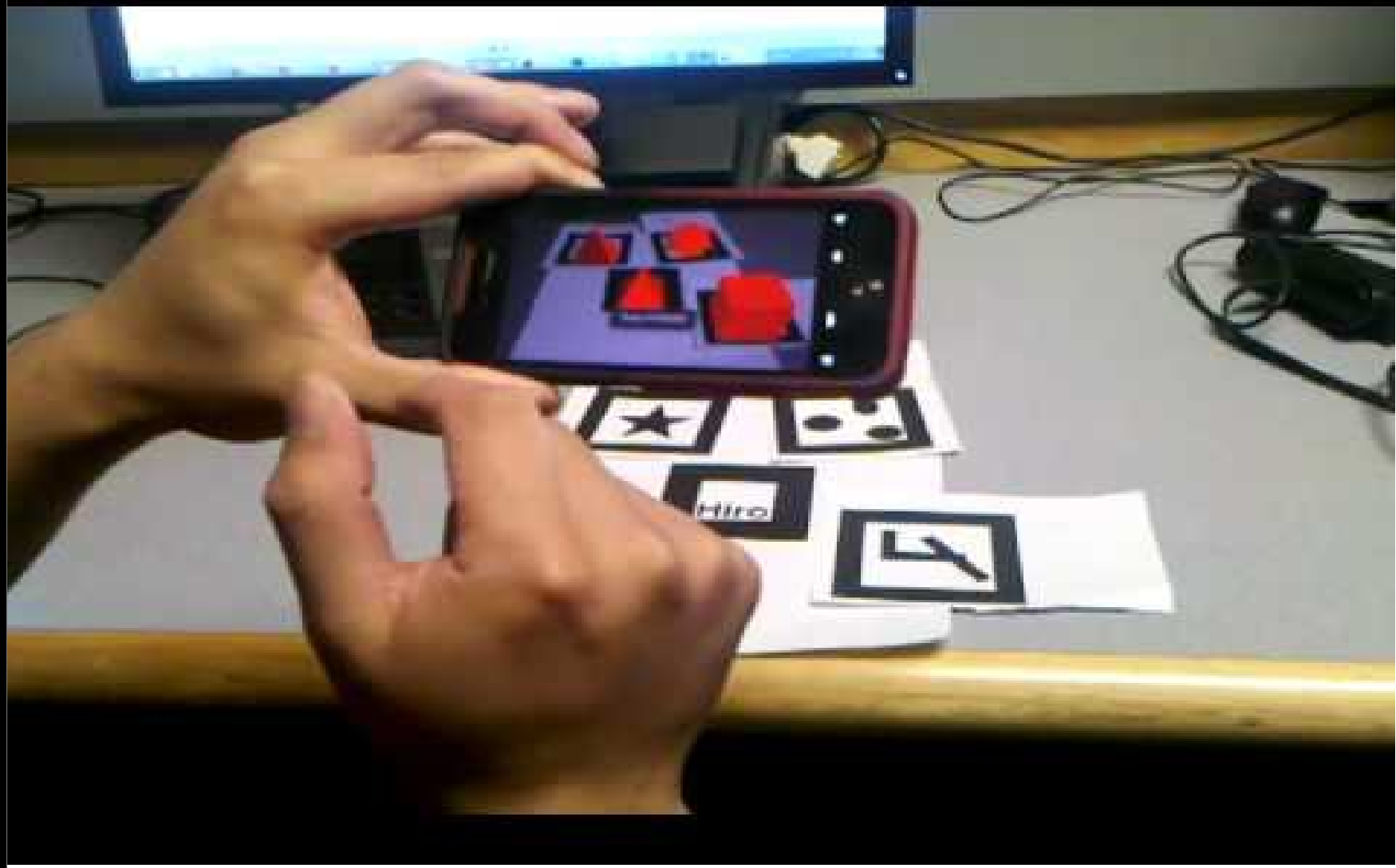
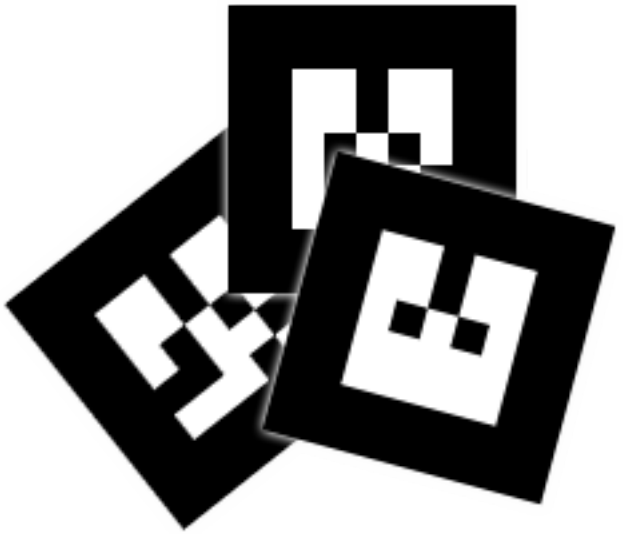


Figure 1: Input/Output Diagram

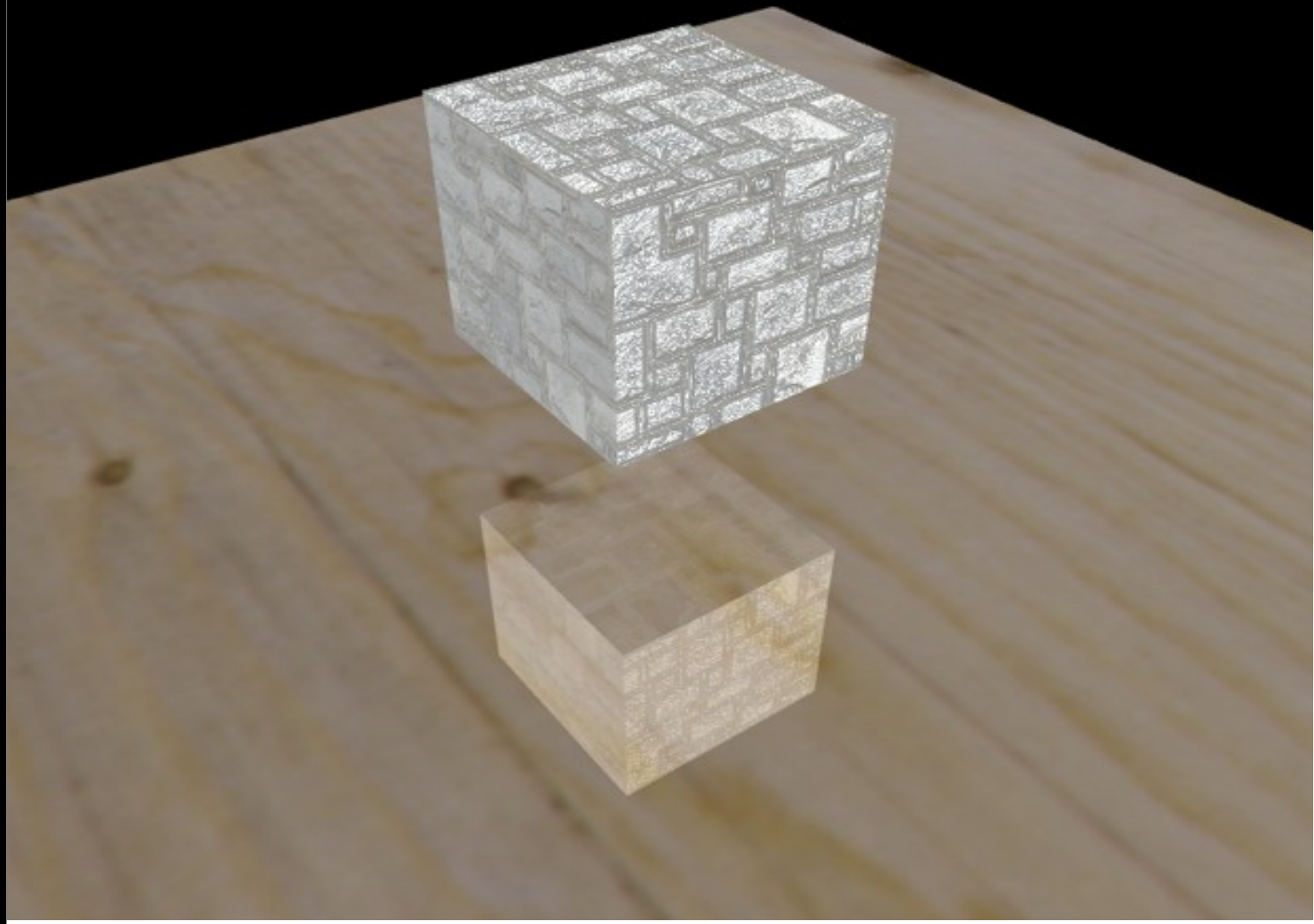


Input a live video stream and augment it by replacing the tracked marker with a photorealistic representation of the chosen 3D architectural model on an Android mobile device.

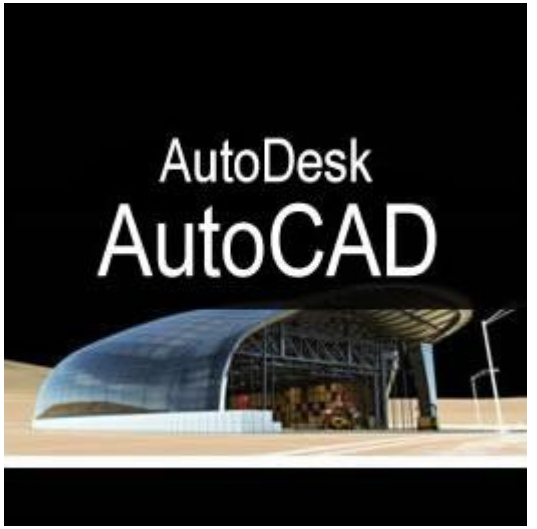
Scope



Marker Based Augmented Reality



Reflection and Refraction



.DWG file format

Android

Literature Survey

SOFTWARE LIBRARIES

- PTAM
- ArUco
- ARToolKitPlus
- Studierstube Tracker

FRAMEWORKS AND SDK

- Studierstube ES
- AndAR
- D'Fusion Studio
- Qualcomm AR SDK

AndAR

- by Tobias Domhan

Requirement Analysis

Software Requirements

Android SDK

Eclipse IDE

Software Requirements

OpenGL ES 2.0

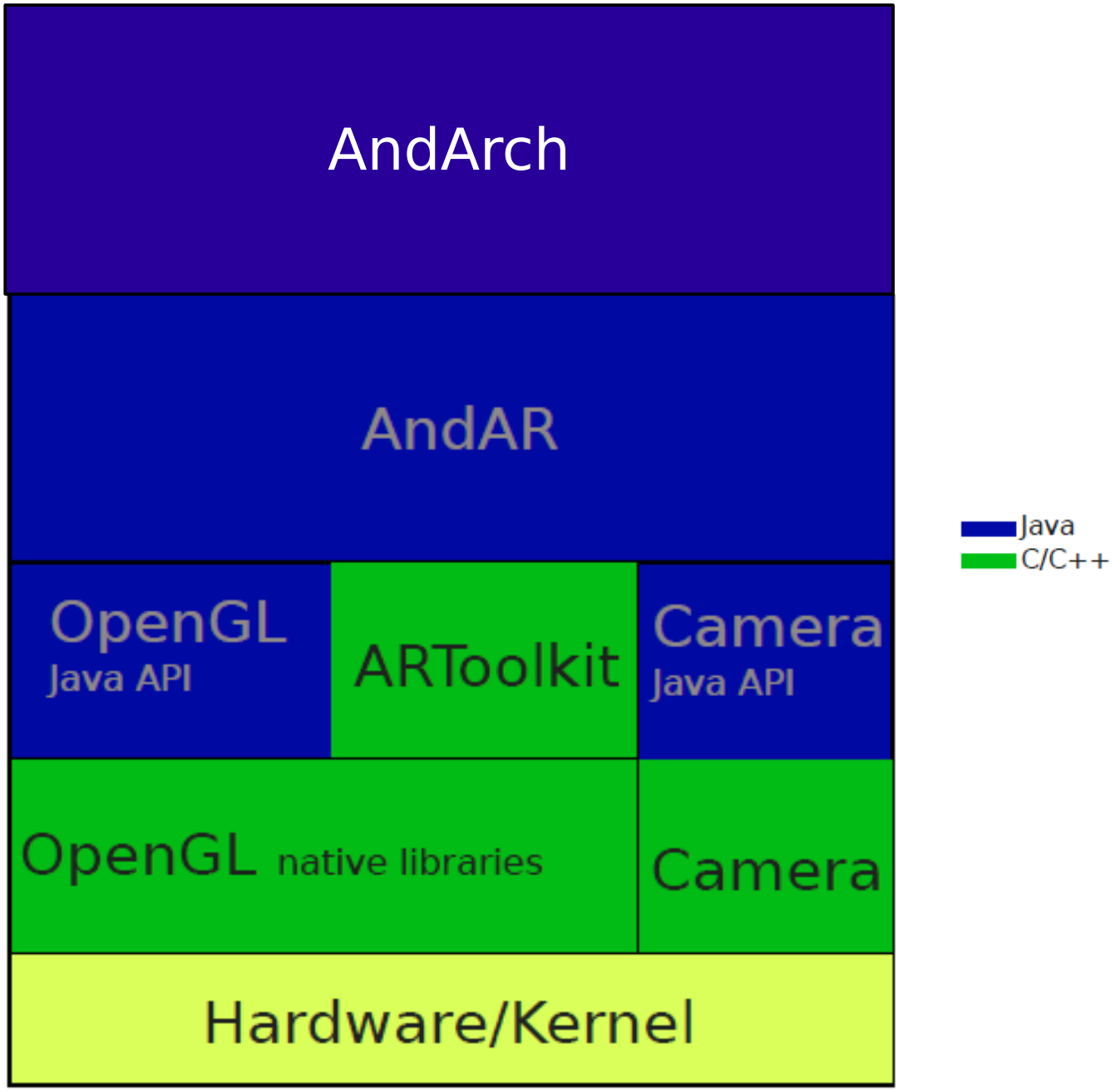
GNU Image Manipulation Program

Hardware Requirements

LG Optimus P500

Intel Pentium 4 or Higher

Proposed System



System Design

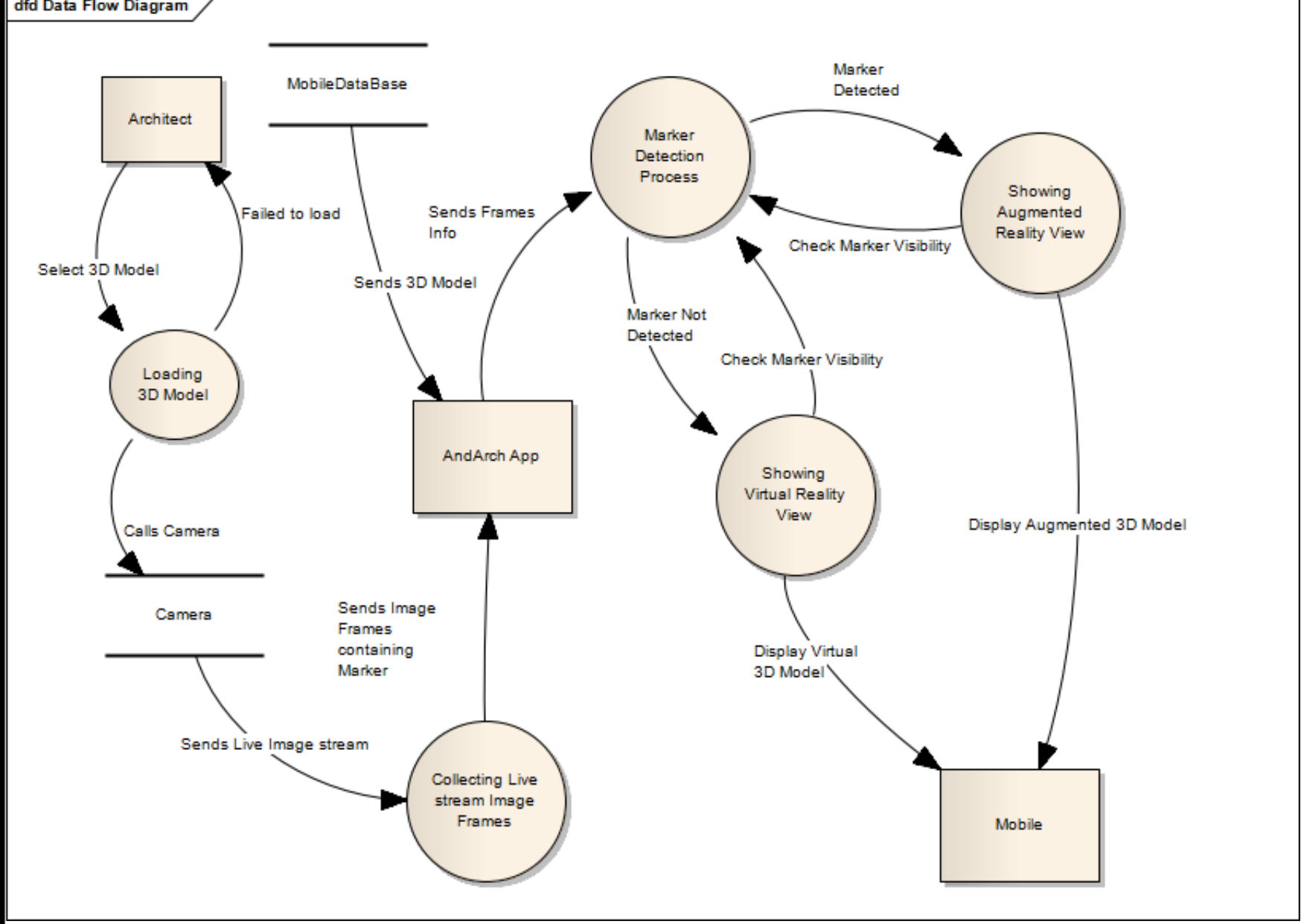


Figure 8: Data Flow Diagram

UML Diagrams

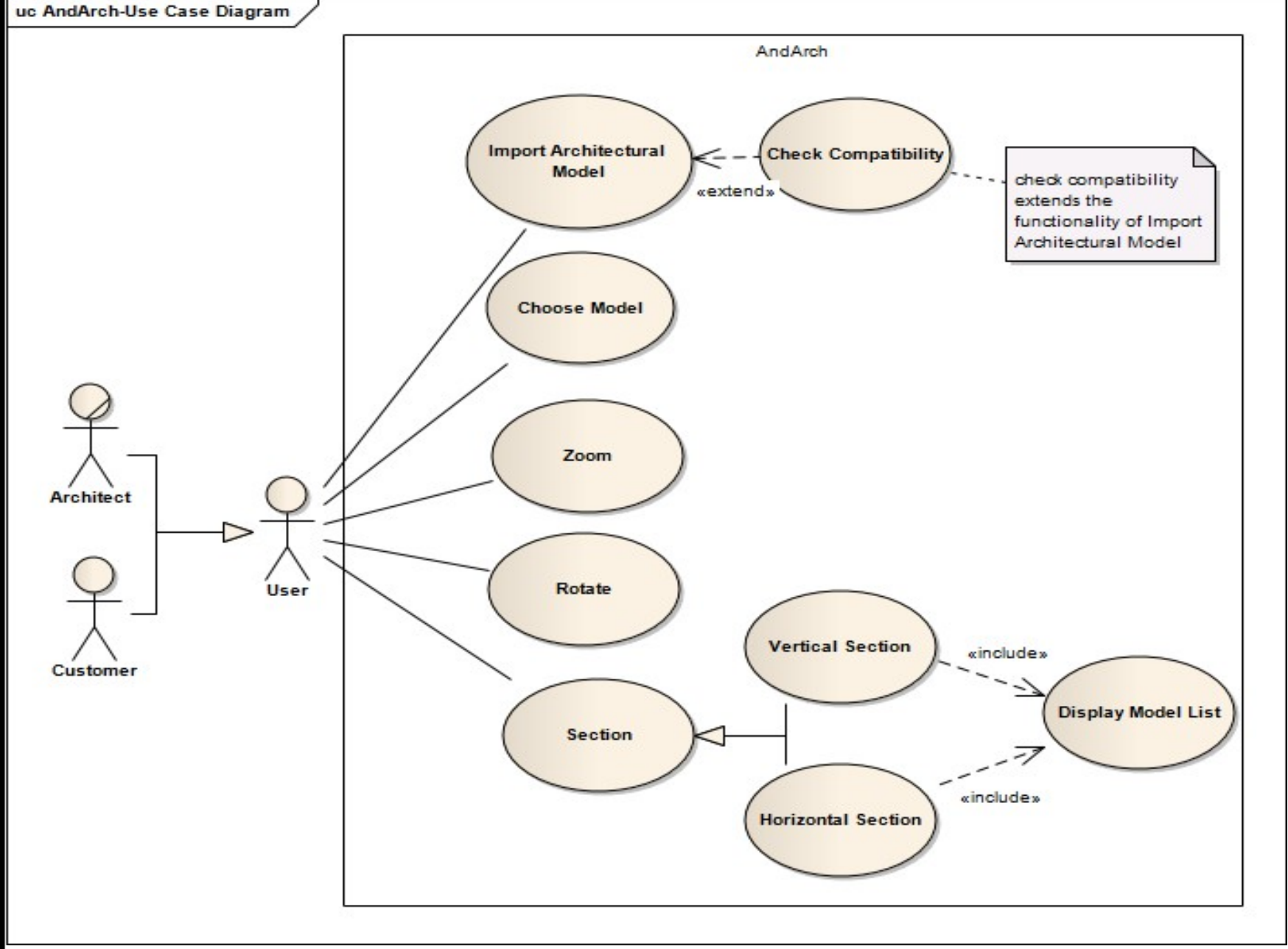


Figure 2: Use Case Diagram

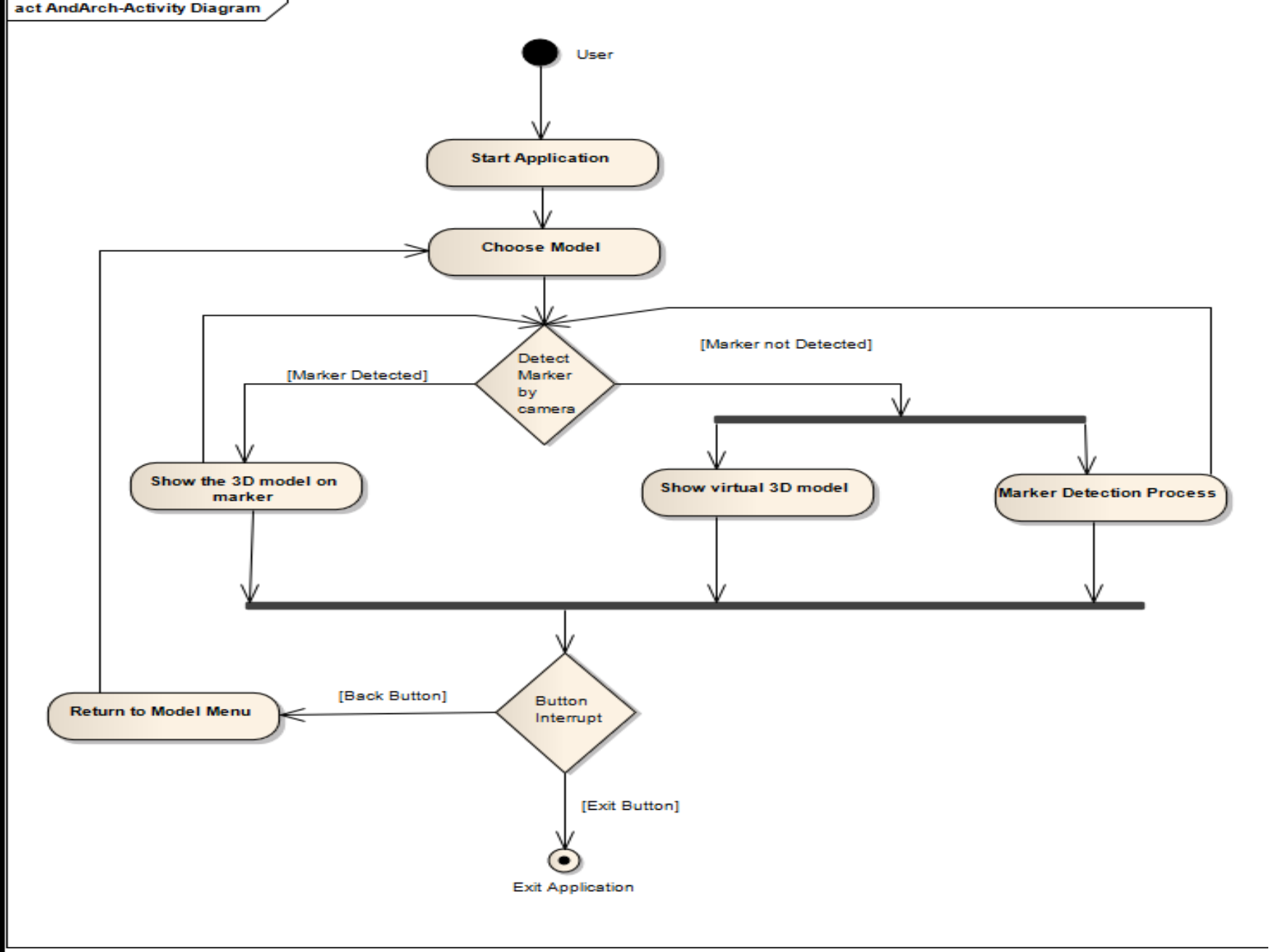


Figure 3: Activity Diagram

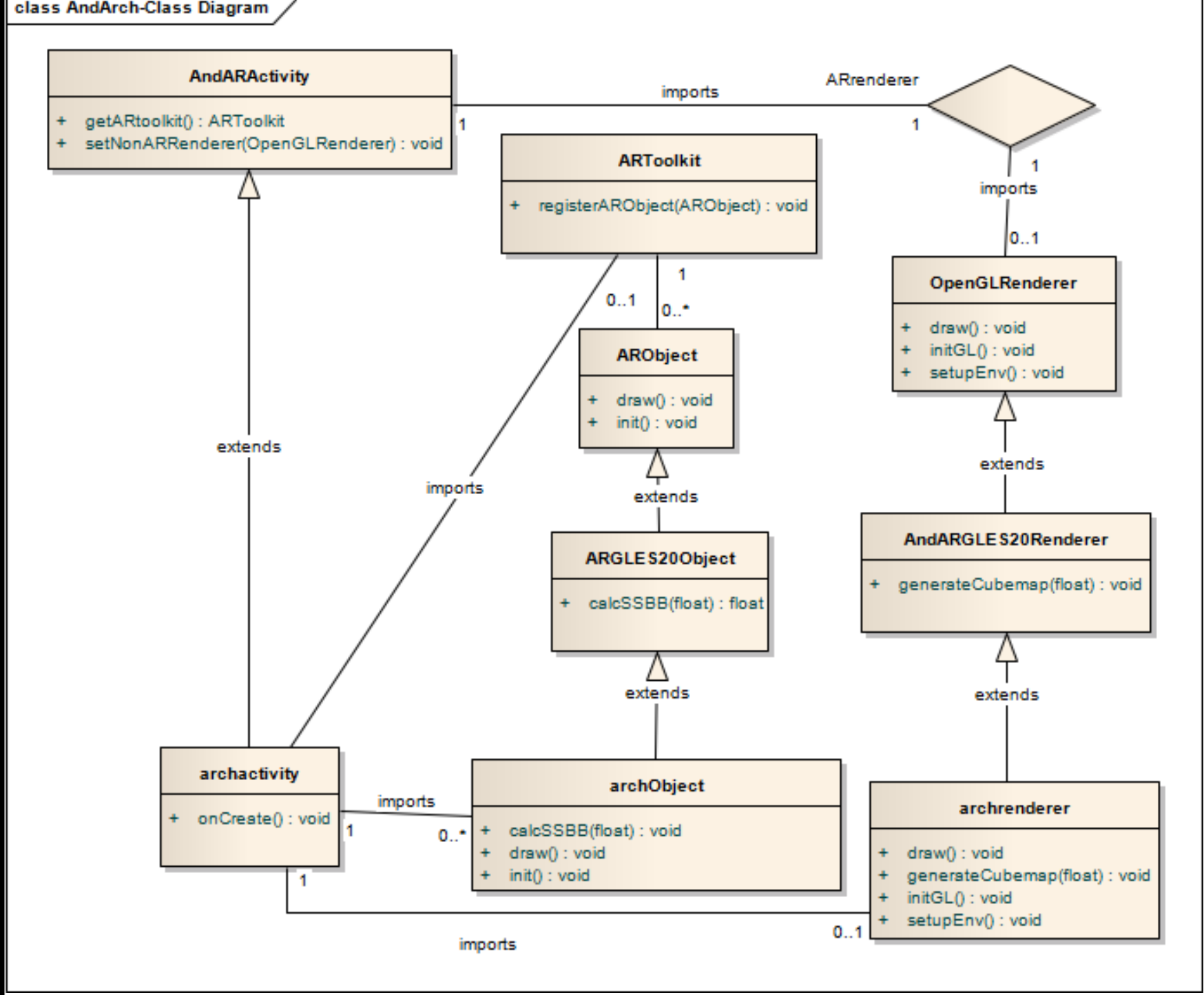


Figure 4: Class Diagram

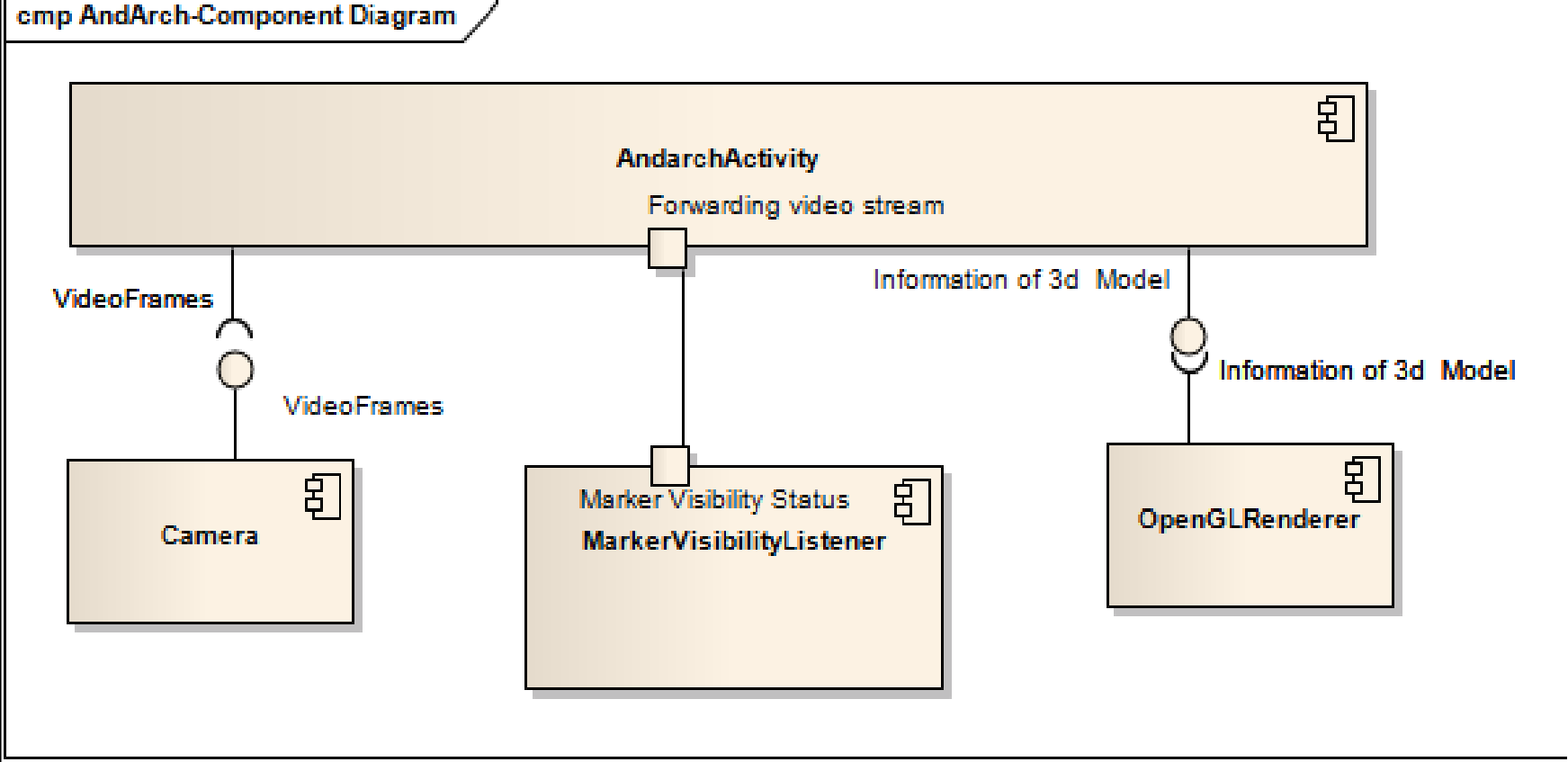


Figure 5: Component Diagram

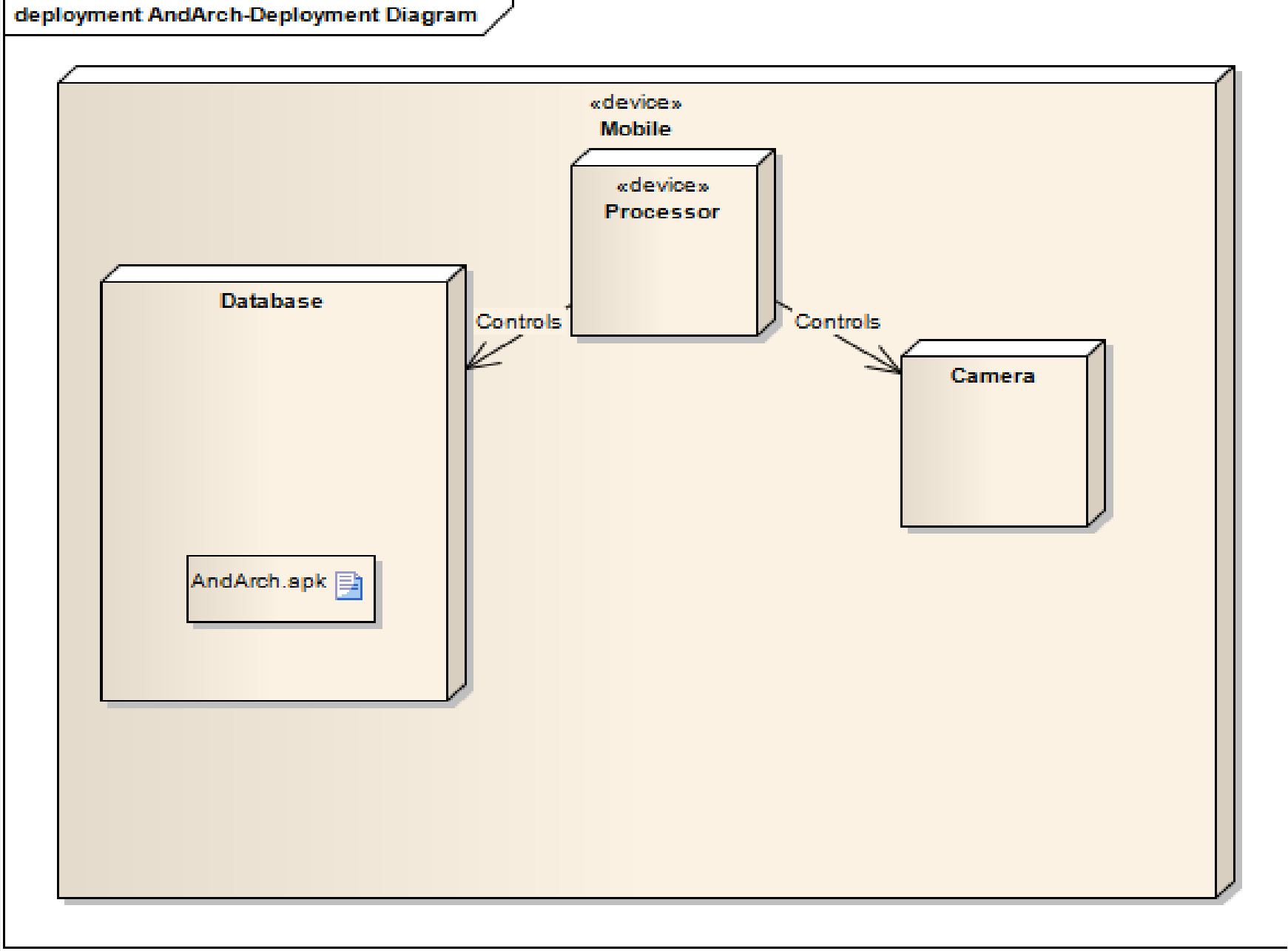


Figure 6: Deployment Diagram

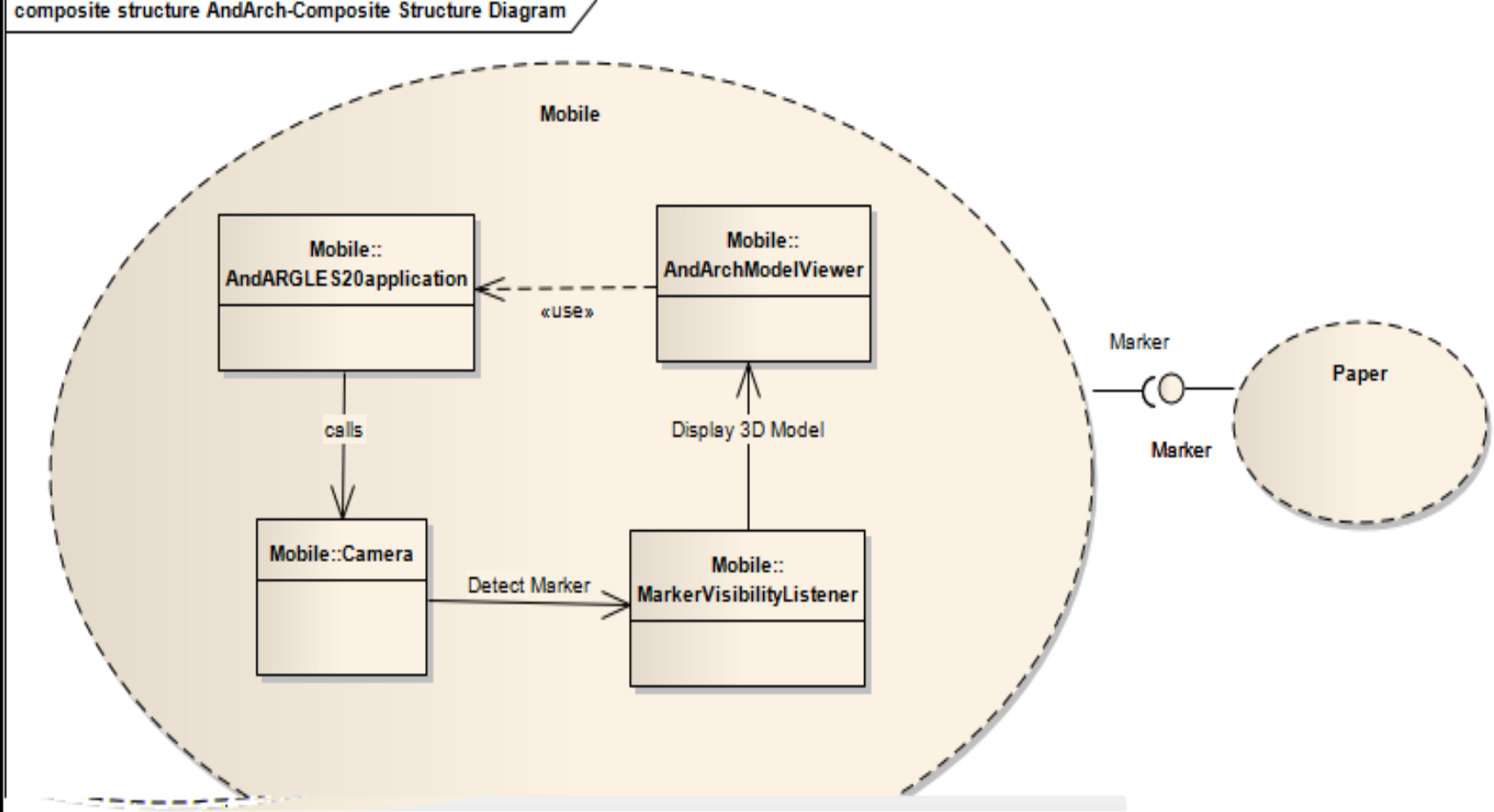


Figure 7: Composite Structure Diagram

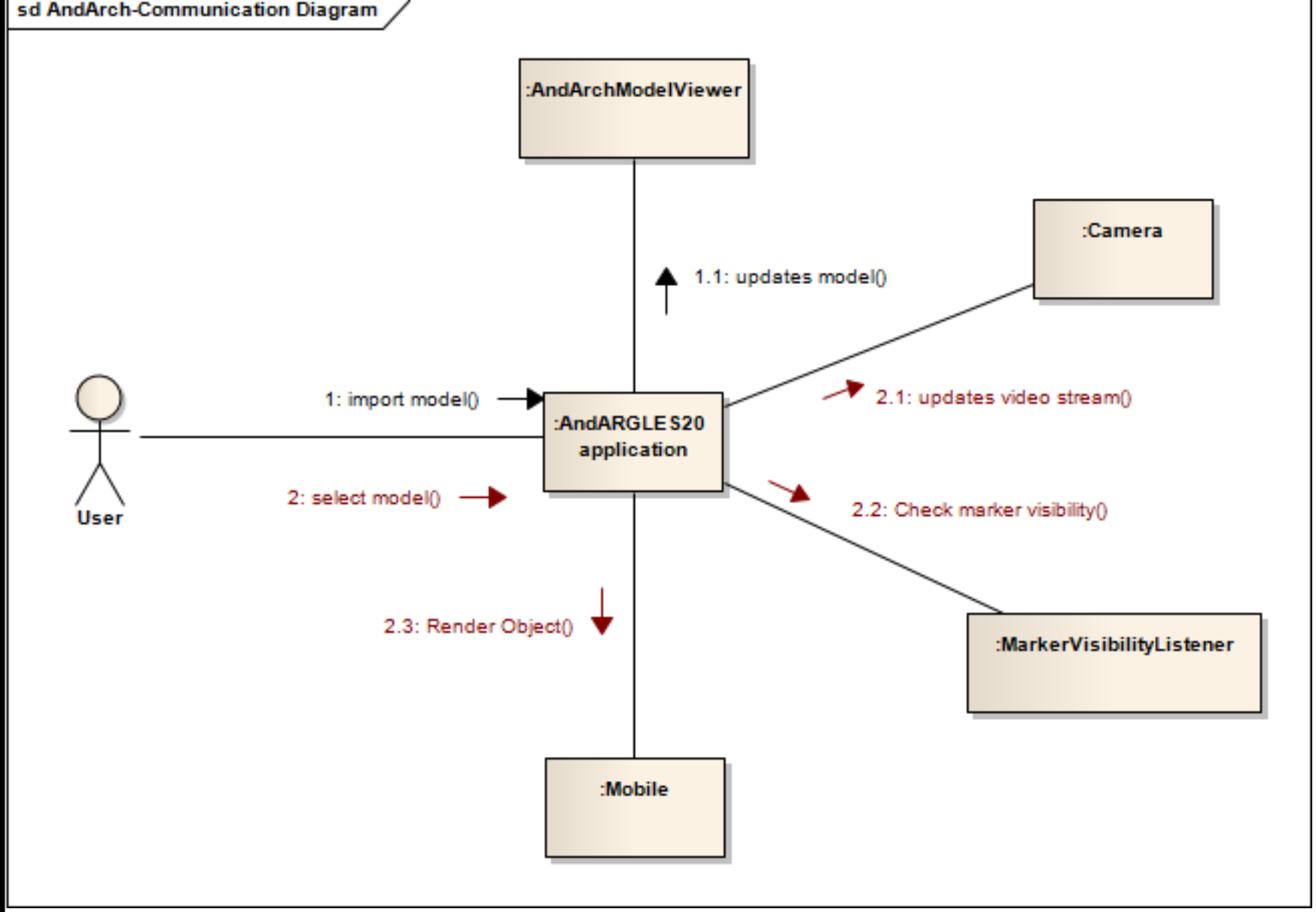


Figure 9: Communication Diagram

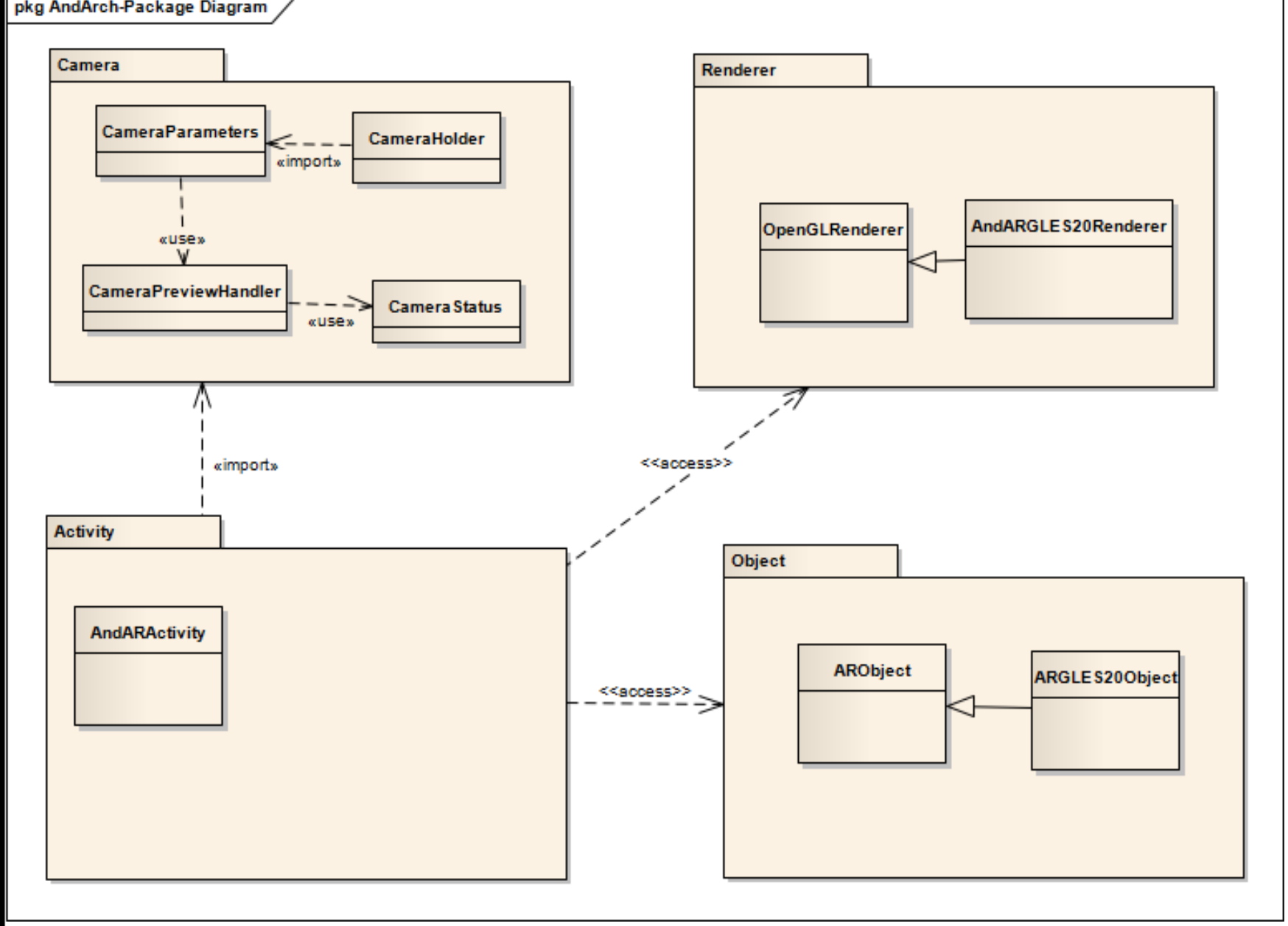


Figure 10: Deployment Diagram

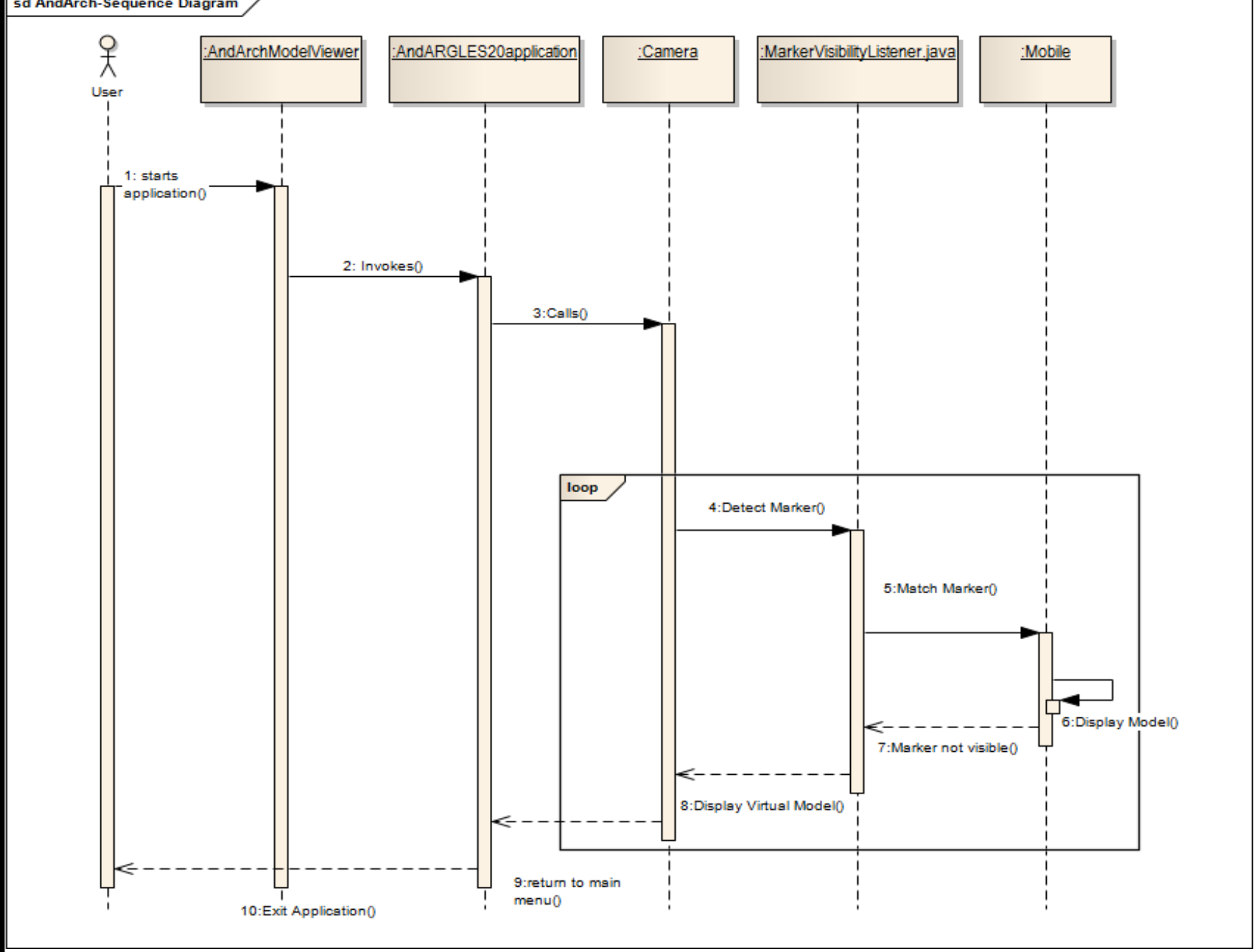


Figure 11: Sequence Diagram

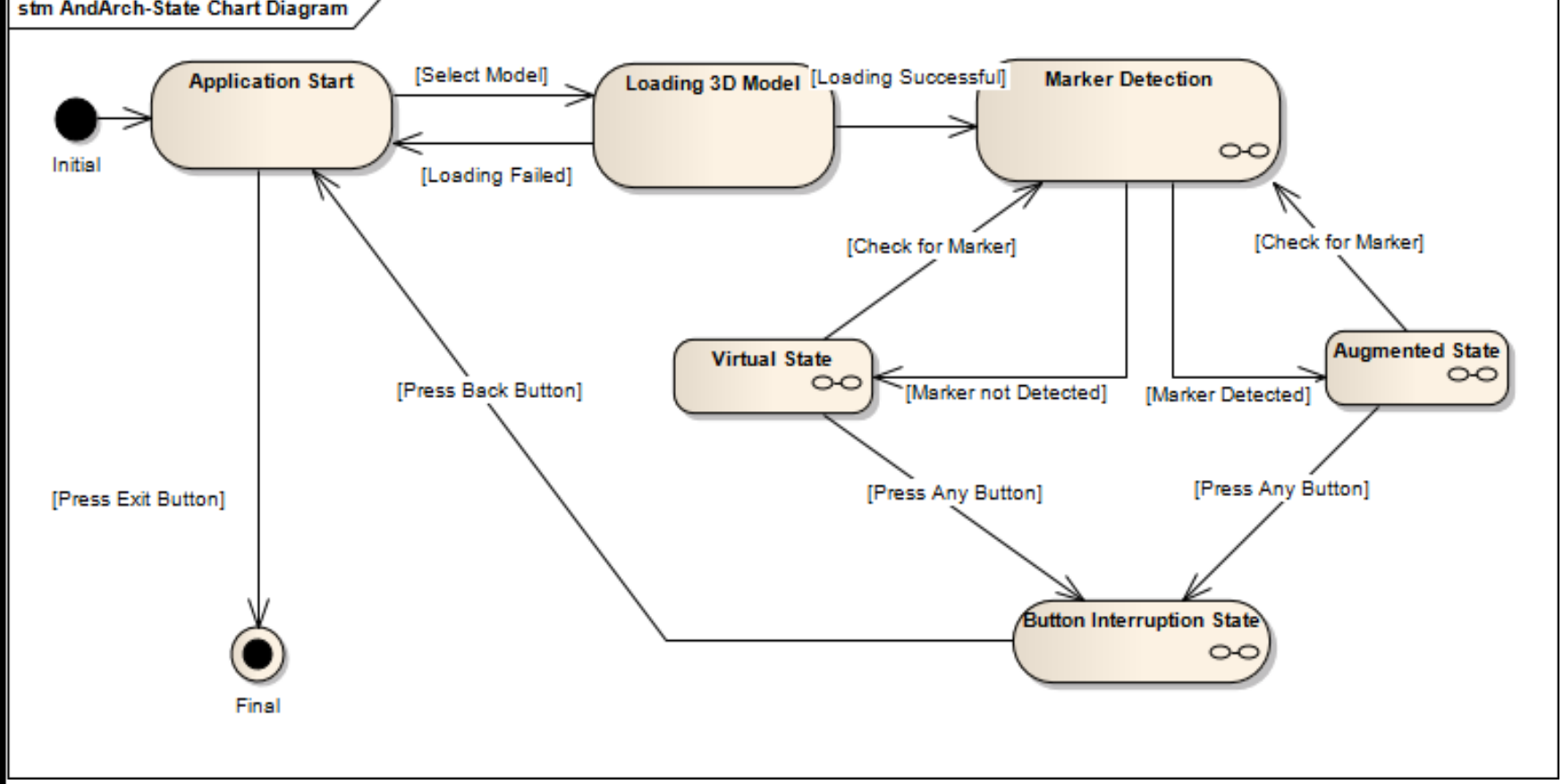


Figure 12: State Chart Diagram

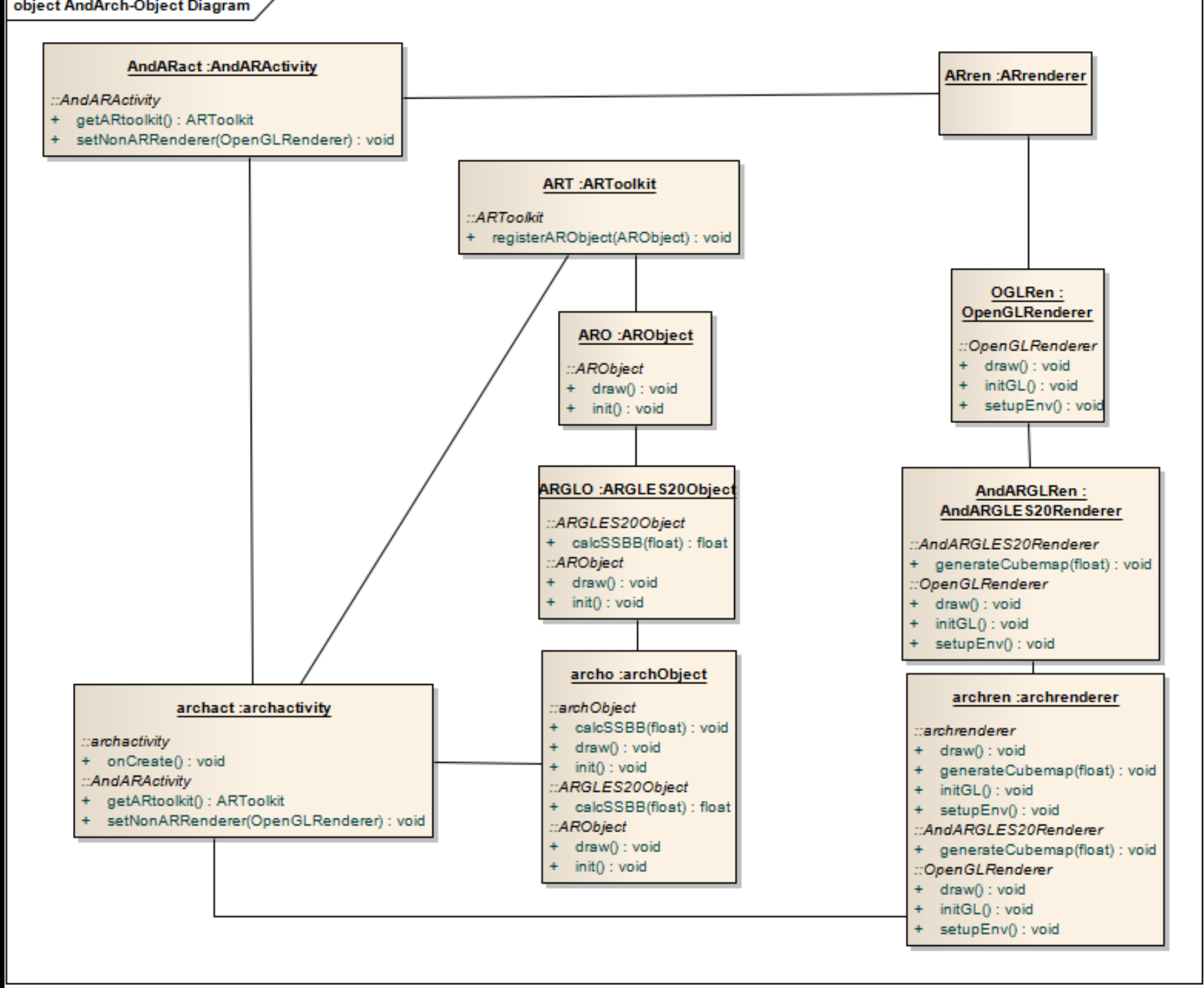


Figure 13: Object Diagram

Mathematical Model

$$\begin{bmatrix} X_C \\ Y_C \\ Z_C \\ 1 \end{bmatrix} = \begin{bmatrix} R_{11} & R_{12} & R_{13} & T_1 \\ R_{21} & R_{22} & R_{23} & T_2 \\ R_{31} & R_{32} & R_{33} & T_3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_M \\ Y_M \\ Z_M \\ 1 \end{bmatrix}$$

$$= \mathbf{T_{CM}} \begin{bmatrix} X_M \\ Y_M \\ Z_M \\ 1 \end{bmatrix}$$

Translation and Rotation Matrix

$$d^2 = (x_I - x_0)^2 + (y_I - y_0)^2$$

$$p = \{1 - fd^2\}$$

$$x_O = p(x_I - x_0) + x_0, \quad y_O = p(y_I - y_0) + y_0$$

(x_0, y_0) : Center Coordinates of Distortion

f: Distortion Factor

Calculating Ideal and Observed Screen Coordinates

$$\begin{bmatrix} hX_I \\ hY_I \\ h \end{bmatrix} = \begin{bmatrix} sf_x & 0 & x_c & 0 \\ 0 & sf_y & y_c & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} X_C \\ Y_C \\ Z_C \\ 1 \end{bmatrix} = \mathbf{C} \begin{bmatrix} X_C \\ Y_C \\ Z_C \\ 1 \end{bmatrix}$$

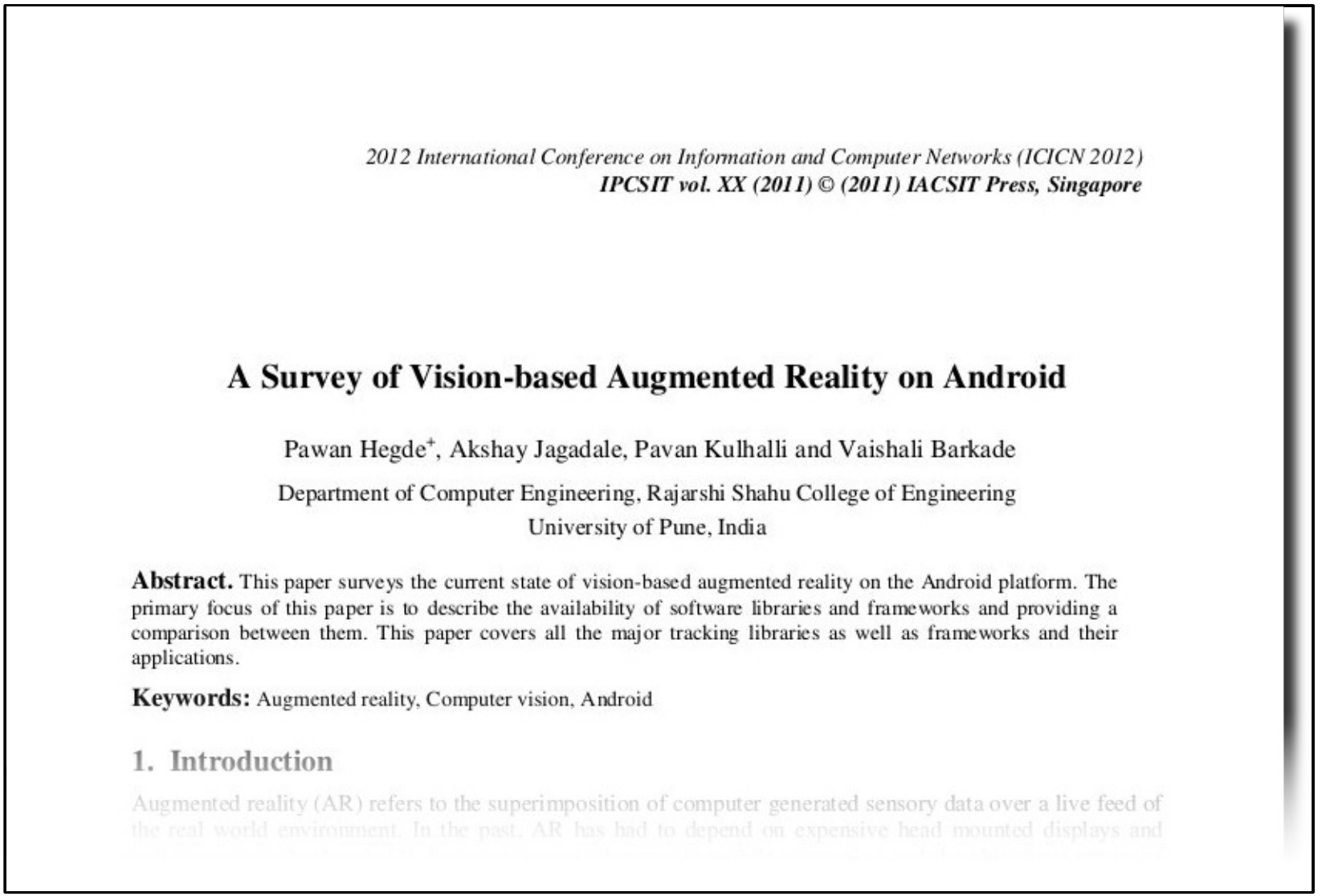
Perspective

$$\begin{bmatrix} h\hat{x}_i \\ h\hat{y}_i \\ h \end{bmatrix} = \mathbf{C}\cdot\mathbf{T}_{\mathbf{CM}} \begin{bmatrix} X_{Mi} \\ Y_{Mi} \\ Z_{Mi} \\ 1 \end{bmatrix}, \quad i = 1,2,3,4$$

$$err = \frac{1}{4} \sum_{i=1,2,3,4} \left\{ \left(x_i - \hat{x}_i\right)^2 + \left(y_i - \hat{y}_i\right)^2 \right\}$$

Search T_{cm} by Minimizing Errors

Papers



2012 International Conference on Information and Computer Networks (ICICN 2012)
IPCSIT vol. XX (2011) © (2011) IACSIT Press, Singapore

A Survey of Vision-based Augmented Reality on Android

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Abstract. This paper surveys the current state of vision-based augmented reality on the Android platform. The primary focus of this paper is to describe the availability of software libraries and frameworks and providing a comparison between them. This paper covers all the major tracking libraries as well as frameworks and their applications.

Keywords: Augmented reality, Computer vision, Android

1. Introduction

Augmented reality (AR) refers to the superimposition of computer generated sensory data over a live feed of the real world environment. In the past, AR has had to depend on expensive head mounted displays and

Pawan Hegde, Akshay Jagadale, Pavan Kulhalli, Vaishali Barkade, “A Survey of Vision-based Augmented Reality on Android”, unpublished

Conferences/Journals that accepted the paper

17th International Symposium on Artificial Life and Robotics, Japan.

2nd Annual International Conference on Control, Automation, and Robotics (CAR 2012), Thailand.

2012 International Conference on Information and Computer Networks, Singapore. [Reviews]

2011 IEEE International Conference on Computational Intelligence and Computing Research.

References

[1] T. Domhan, “Augmented reality on Android Smartphone”, Jun 2010. “AndAR”, **http://code.google.com/p/andar**

[2] Griffin Milsap, Eric Bourland, “Advanced Rendering for Augmented Reality on Mobile devices”, **http://code.google.com/p/andarshaders**

Thank You

Any Questions?