Active 3D Smartphone App

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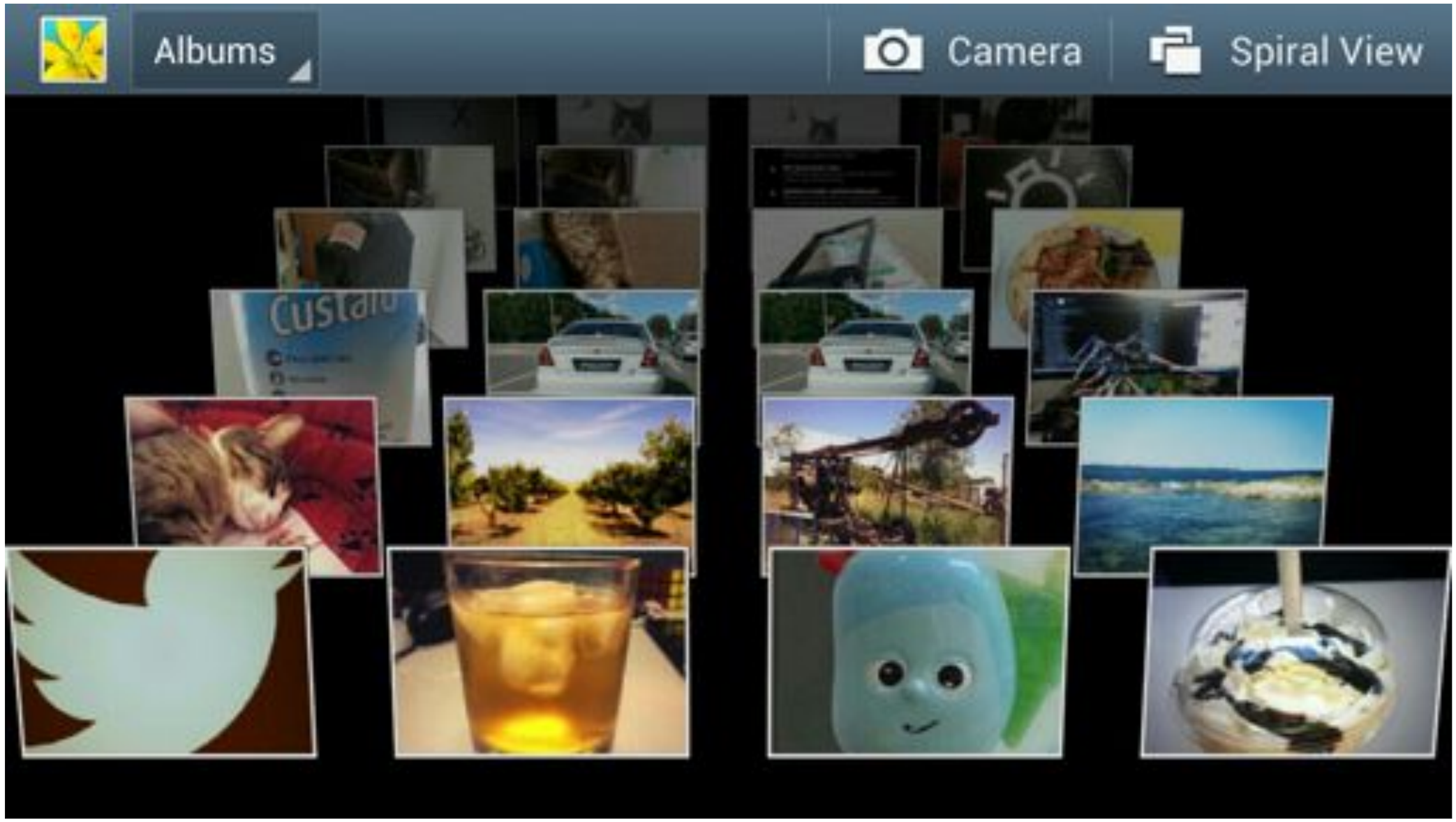
Overview

Photos are static slices of time



Overview

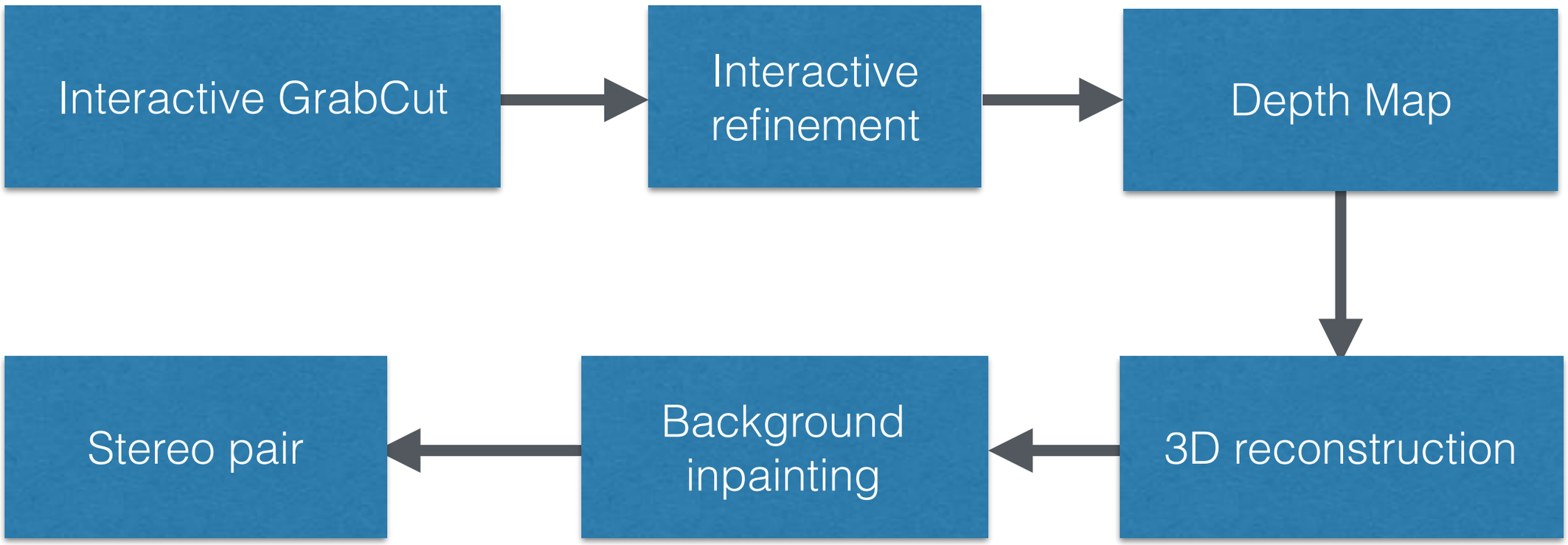
Active images

Replace background with animated graphics

Render foreground with two slightly different perspectives

Pipeline

Active images



Segmentation

Interactive foreground segmentation

Separating foreground and background based on two-step user input

GMM - Markov Random field - energy minimisation - graph cut

Image: Microsoft Research

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GMM - Markov Random field - energy minimisation - graph cut

$$\mathbf{E(\alpha,k,\theta,z) = U(\alpha,k,\theta,z) + V(\alpha,z)}$$

U(α,k,θ,z): Evaluation of fit of opacity to the data (z)
Low score if colours are similar

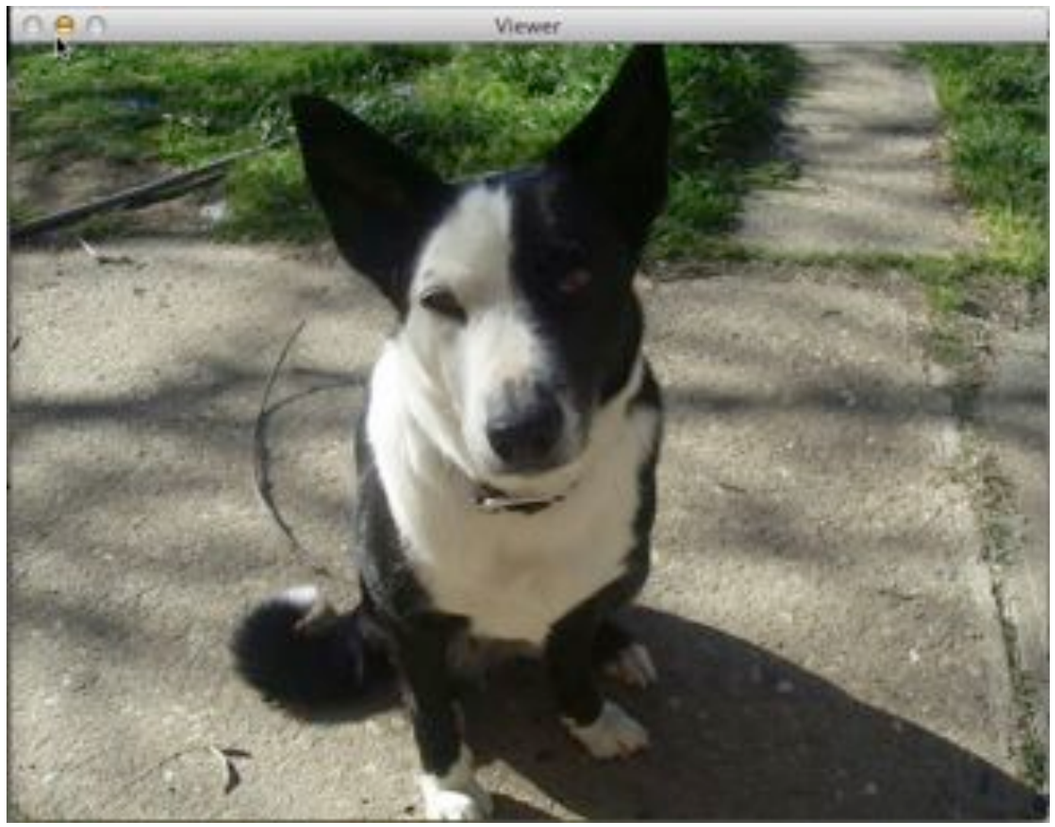
V(α,z): Smoothness term
Larger if there is too much difference between neighbouring pixels

Minimum is **arg min E(α,k,θ,z)**

Segmentation

Background segmentation

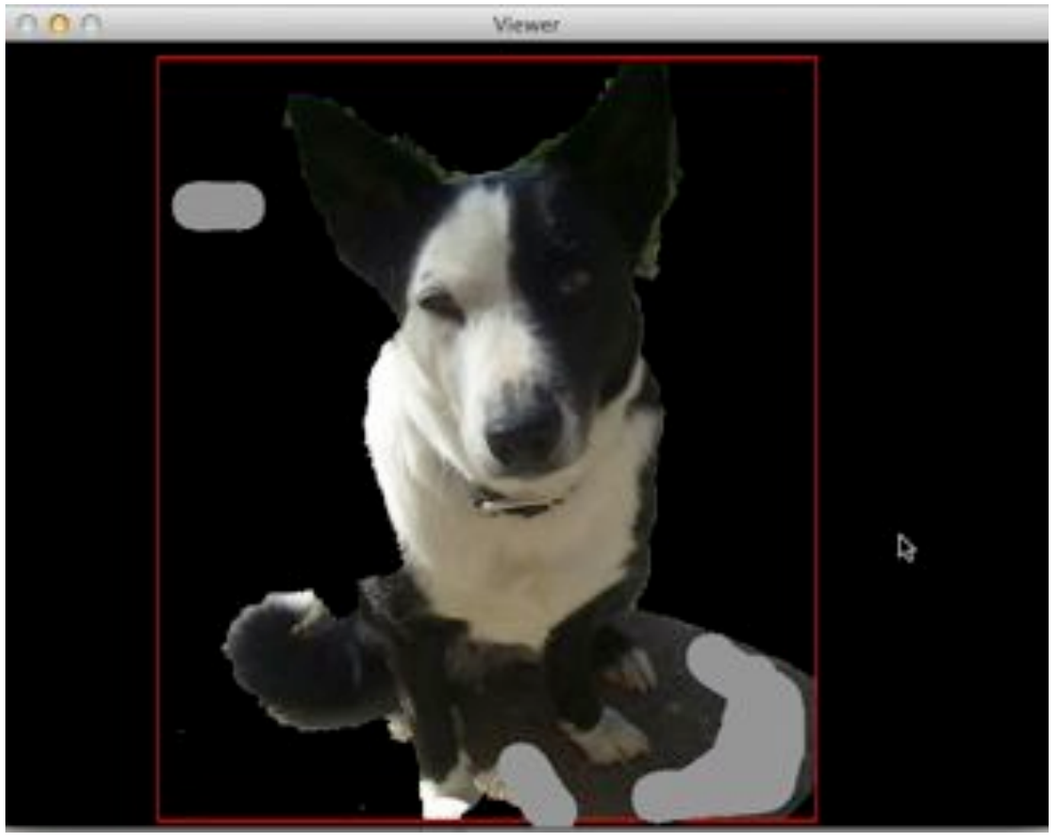
Gaussian colour model with Grabcut algorithm



Depth map

Basic depth contour

Simple depth map based on distance from edge

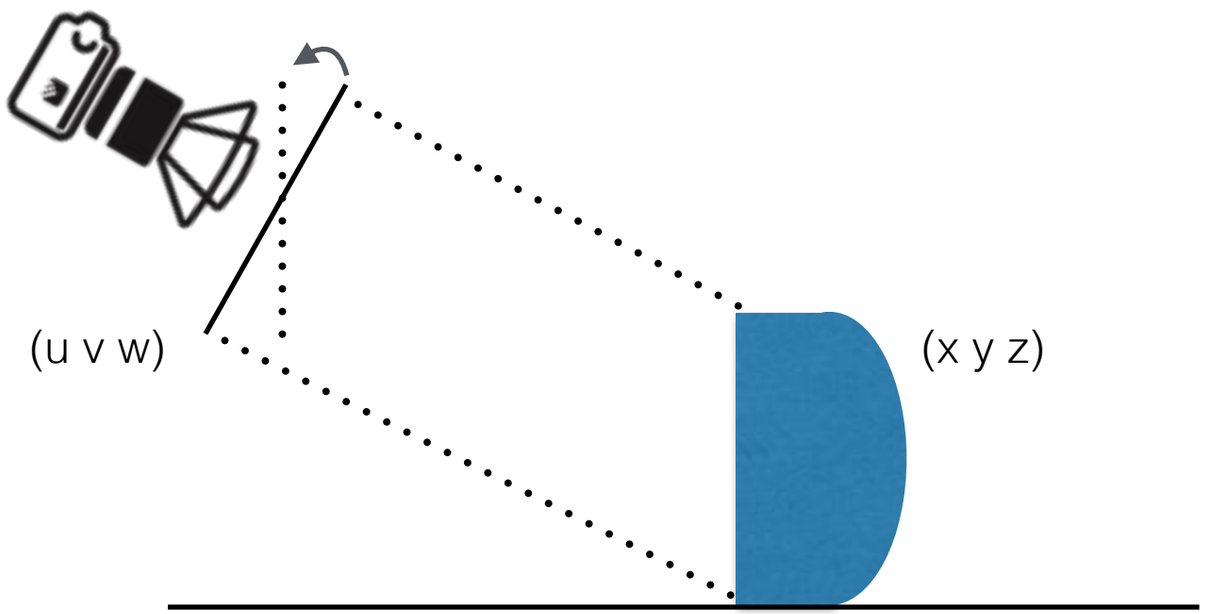


3D Reconstruction

3D reasoning and object completion

Reconstruct the foreground object in 3D space

$$\begin{bmatrix} u \\ v \\ w \end{bmatrix} = s \; R \left(\begin{bmatrix} x \\ y \\ z \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \\ t_z \end{bmatrix} \right)$$



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Stereo view

Perspective rendering

Rendering the virtual 3D object from a different perspective

Apply a translation vector to the object before projecting back onto the image plane

Moving Forward

Alpha matting
Smooth and edges from segmentation

Optimisation
Increase performance for mobile platforms

Background replacement
Option to replace the background with other media

GUI
Enable calculation using user specified parameters