

CSEP 576  
Computer Vision  
Winter 2008

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# Introduction

- What IS computer vision?

the analysis of digital images by a computer

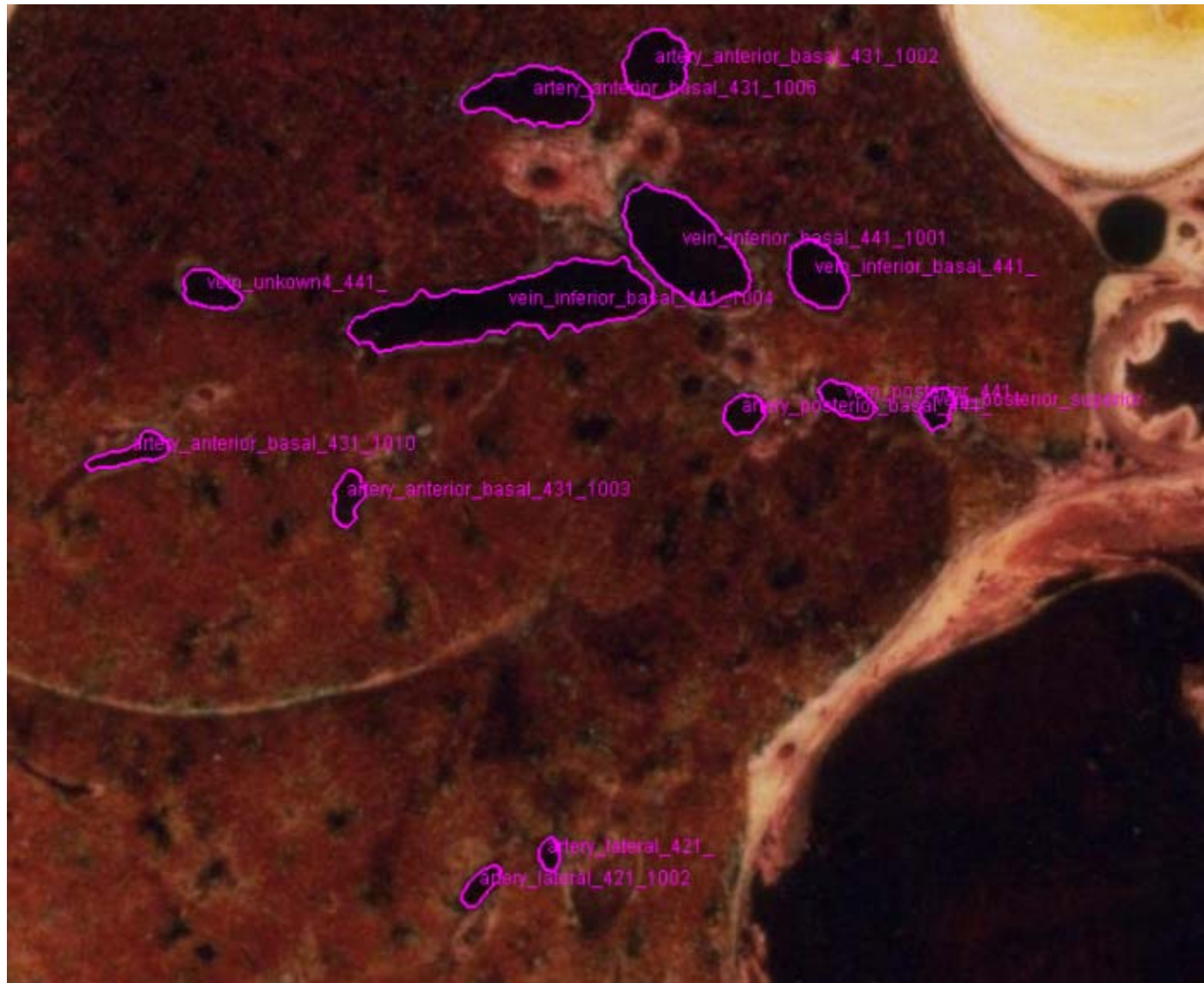
- Where do images come from?

# Applications: Medical Imaging

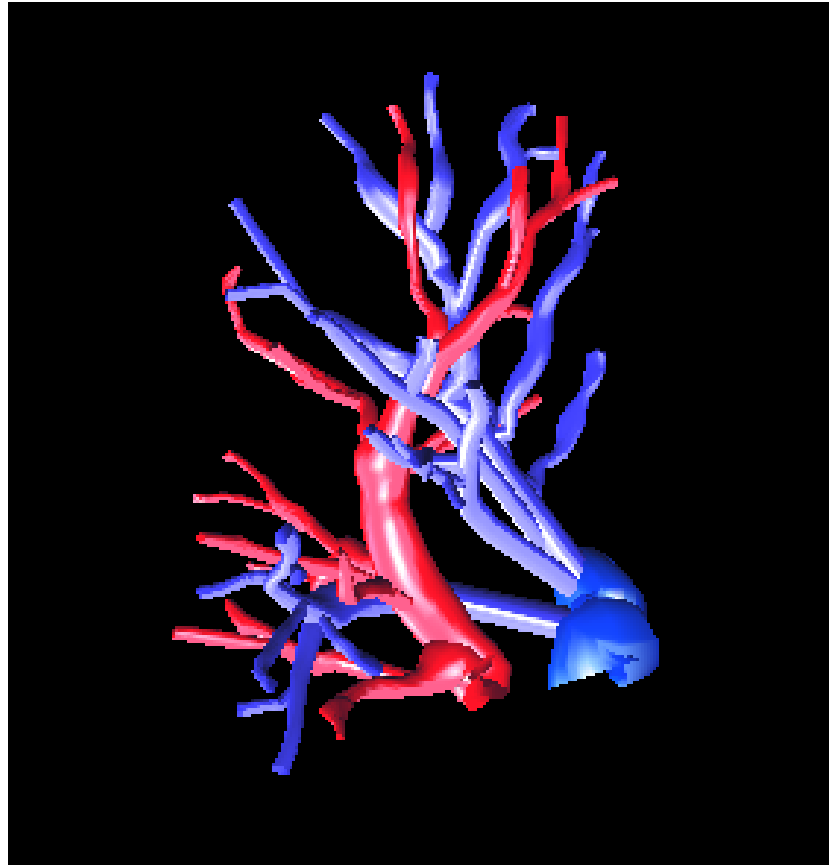
CT image of a patient's abdomen



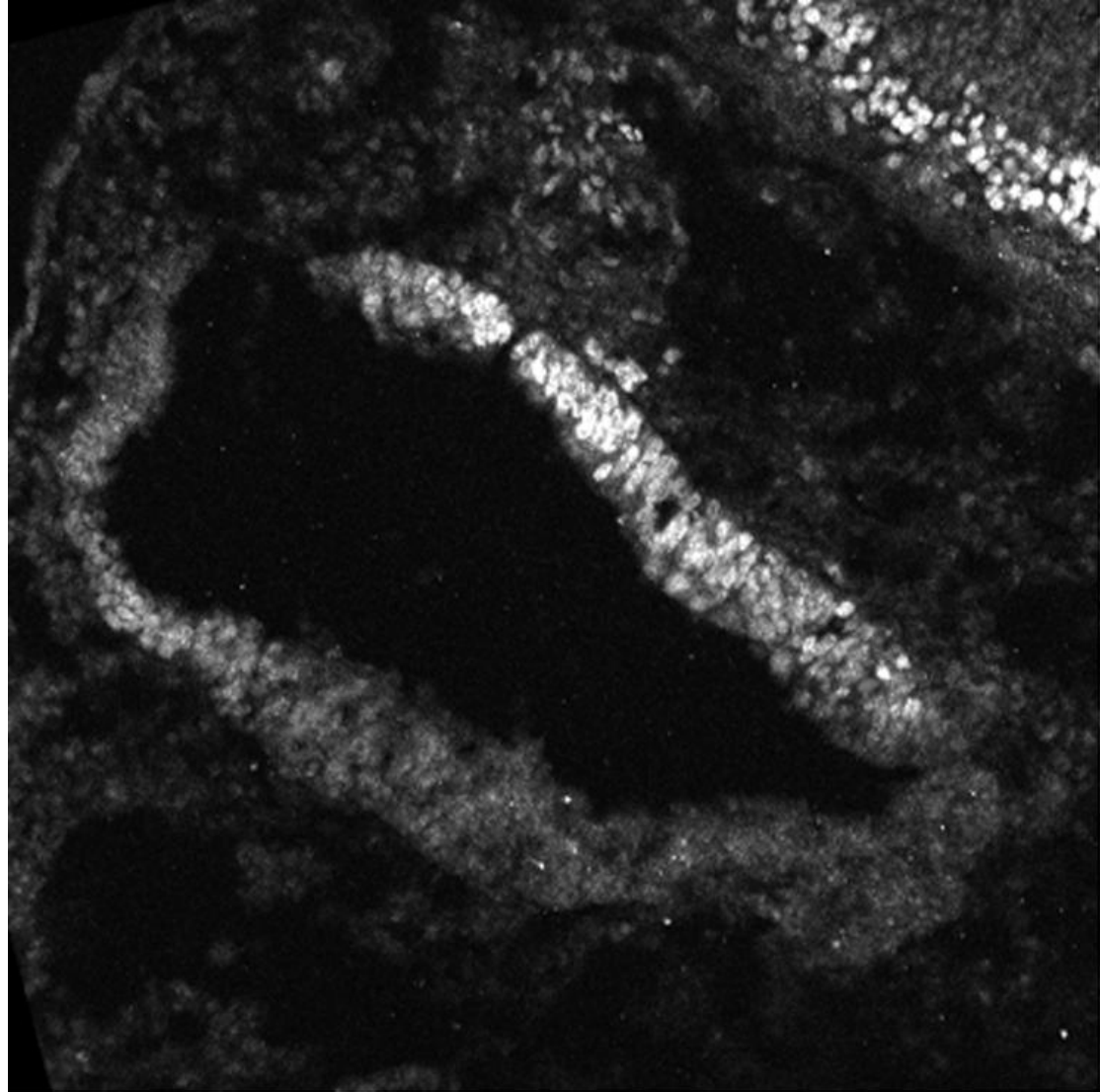
# Visible Man Slice Through Lung



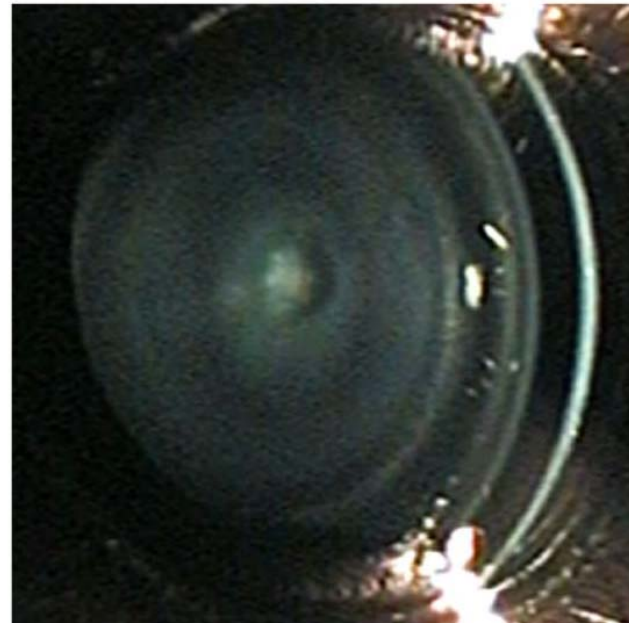
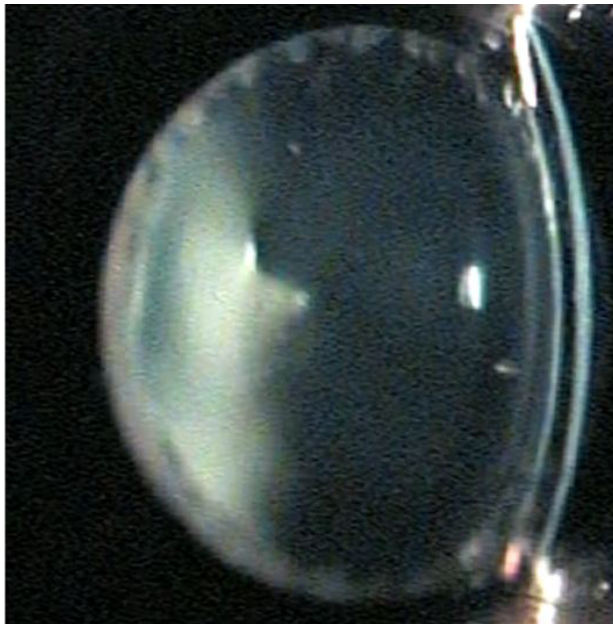
# 3D Reconstruction of the Blood Vessel Tree



# Slice of a Chicken Embryo's Inner Ear



## CBIR of Mouse Eye Images for Genetic Studies



# Robotics

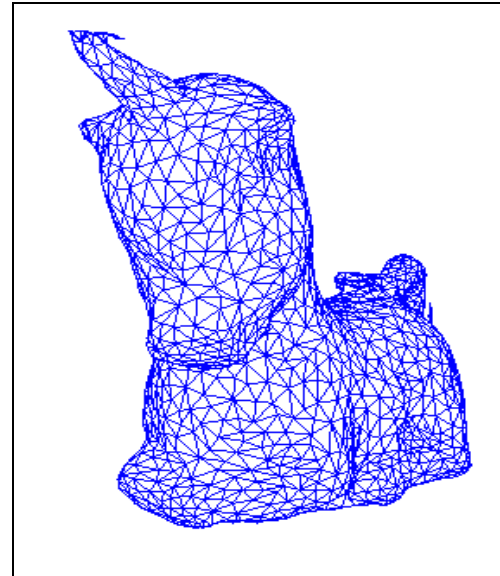
- 2D Gray-tone or Color Images

“Mars” rover



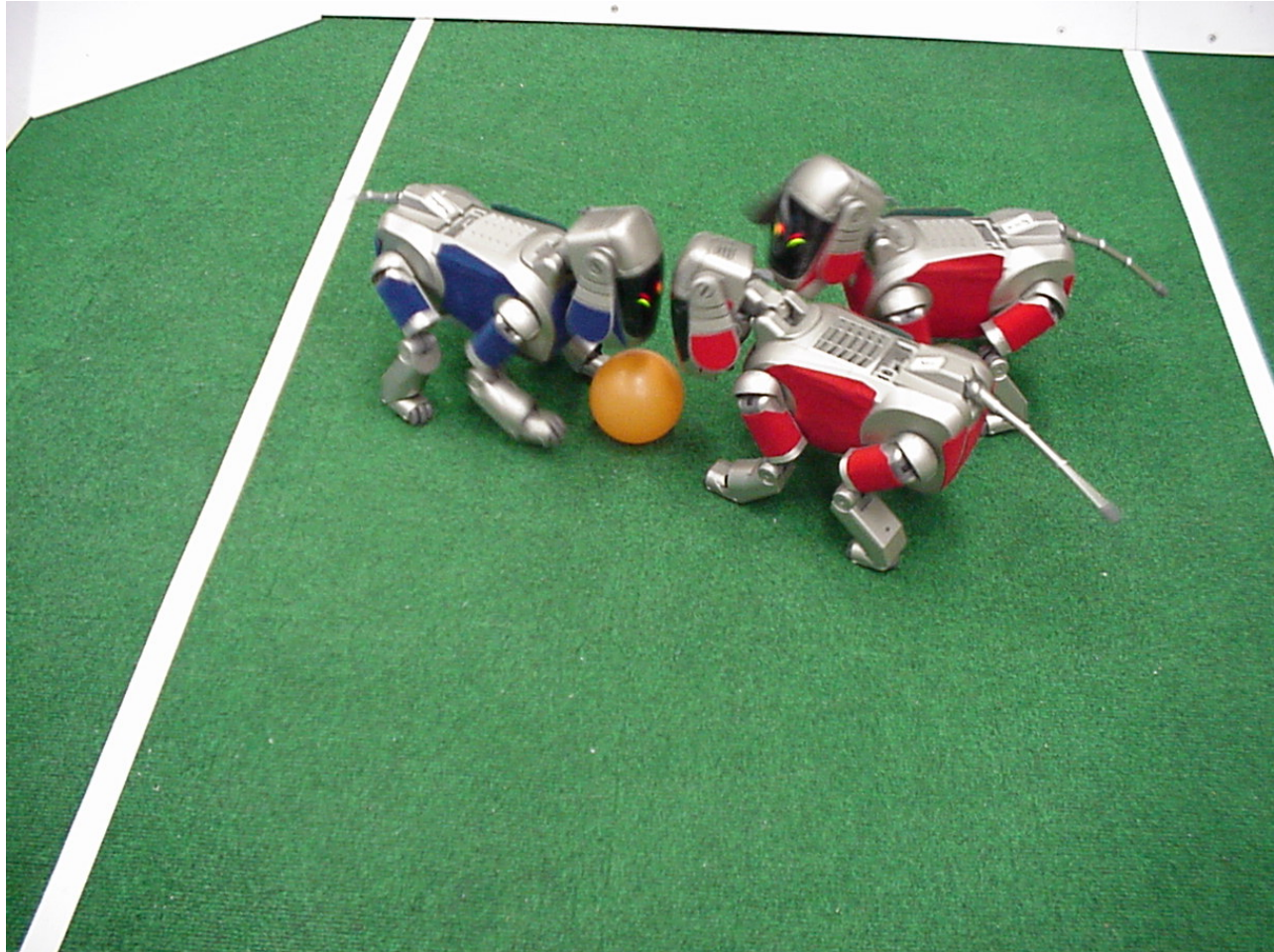
- 3D Range Images

What am I?





- Robot Soccer



# Image Databases:

Images from my Ground-Truth collection:

<http://www.cs.washington.edu/research/imagedatabase/groundtruth>



- retrieve images containing trees

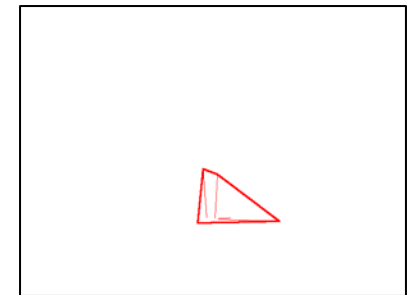
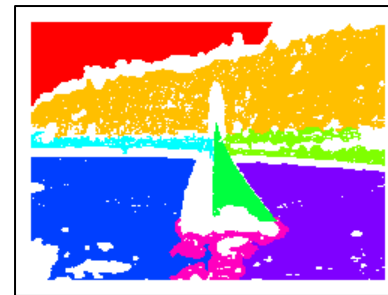
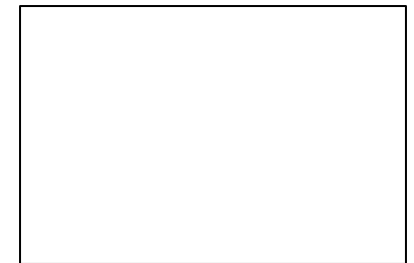
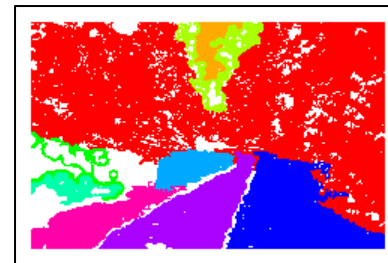
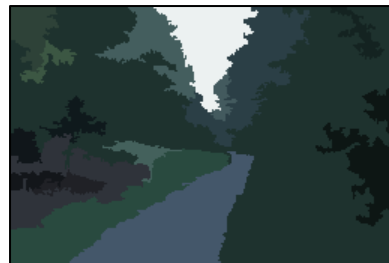
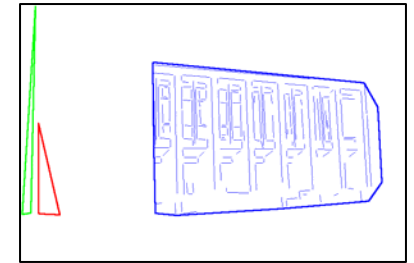
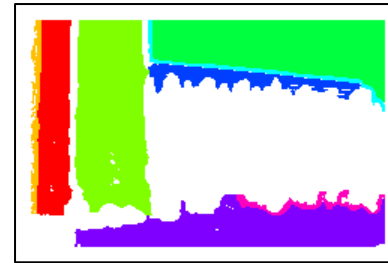
# Some Features for Image Retrieval

Original Images

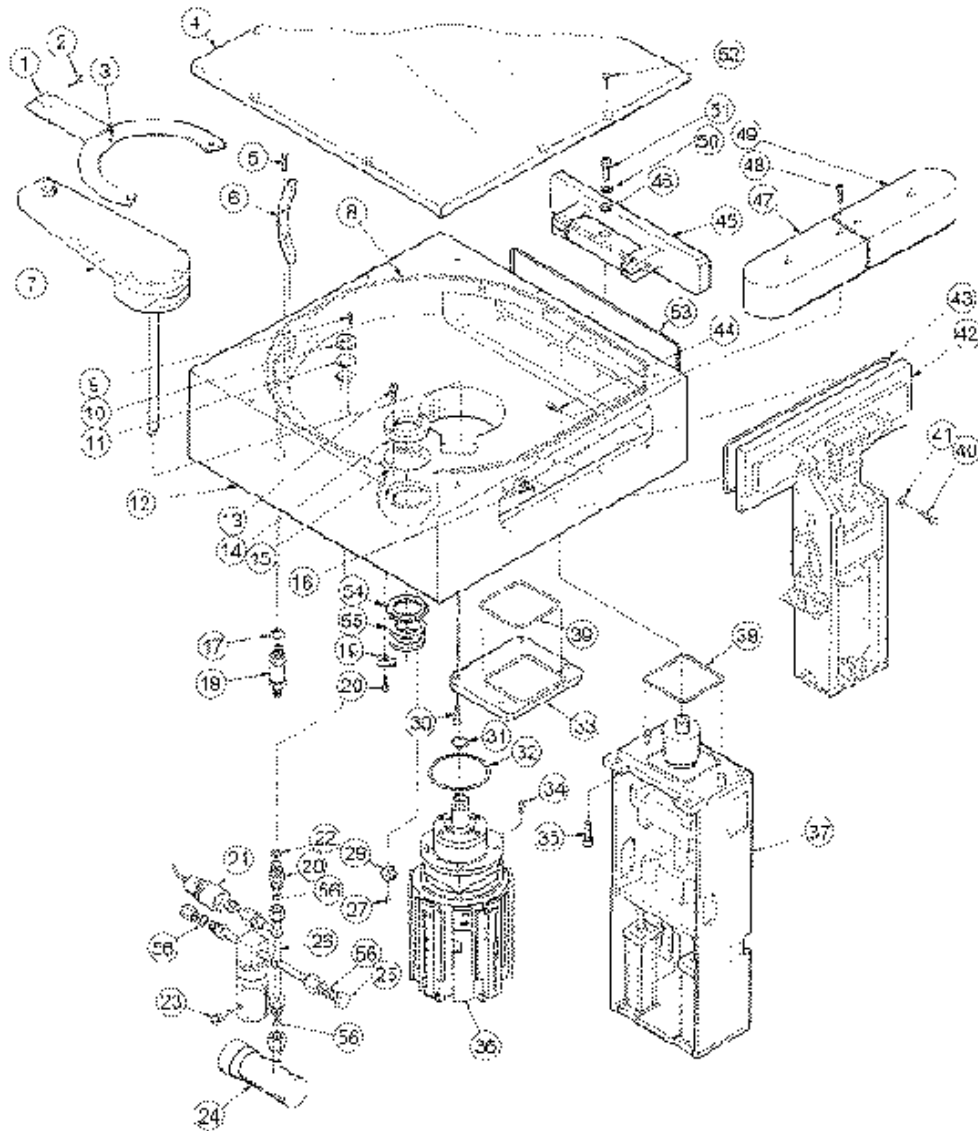
Color Regions

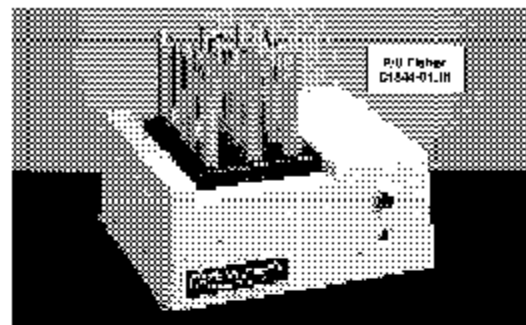
Texture Regions

Line Clusters



# Documents:





**Model 145 Isotemp® Dry Bath Incubator**

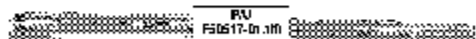
- Holds 1 to 4 heating blocks with choice of 11 well sizes
- Maintains every sample in within  $\pm 0.1^\circ\text{C}$  of temperature

Unique sample wells are shaped so that a uniform circle delivers same amount of heat to all parts of the sample tube. No lameness, no gradient— neither on top at the bottom nor on side or the top—that may invalidate tests. In vials with different liquid walls. Sample tubes rest on insulating plugs. No present localized heating. A low cost, density heater is mounted on a thick alumina heat reflecting plate in the front of the bath. Plate is 1/2" thick, 9.5 mm. Dry bath maintains cleaner problems because tubes are airtight.

Ambient to  $125^\circ\text{C}$  ( $255^\circ\text{F}$ )—with  $\pm 0.1^\circ\text{C}$  control. Dual temperature control—ranged from  $25^\circ$  to  $25^\circ\text{C}$ . Ideal for enzyme reactions, inactivation of sera. Rh studies, glucose monitoring and hemoglobin determination. Dimensions: 8.1 x 15.9 x 4" H. 128 x 28 x 11 cm. With top cover and plug. Heating blocks sold separately (see lower right).

Electrical Requirements	Cat. No.	Each
240V/50/60 Hz, 500W/1500VA approved	11-715-100	419.34
240V/50/60 Hz, 800W	11-715-100A	566.33

Manufactured in Mexico by C. Pacematista Model



**Incu-Block® Partial Immersion Thermometers**

For all standard bath, air blocks and water baths. Critical temperatures ( $25^\circ$ ,  $30^\circ$ ,  $37^\circ$ ,  $56^\circ\text{C}$ ) are marked with arrows. Available with stainless steel, contamination proof Teller® coating. Total length: 175 mm. In immersion: 35 mm.

Range, $^\circ\text{C}$	Dia., mm	Tolerance	Cat. No.	Each
25-57	6.5	blk.	14-992	45.24
25-57	6.0	var.	14-993	46.18

**More Thermometers**

For more thermometers, including digital types,

see page 952

**Model 147 Isotemp® Dry Bath**

- Holds single heating block with choice of 11 well sizes

Similar to Model 145, but with 35" thick (2.0 mm) plate. Ideal for labs with smaller volumes of enzyme and end-point assays. Rh studies and dry incubators. Forward heat-adjusted temperature control between ambient and  $40^\circ\text{C}$  ( $104^\circ\text{F}$ ). Observe thermometer panel in use. Sample tubes rest on adjust control through hole in front panel. Maintains set temperature with consistency and uniformity  $\pm 0.05^\circ\text{C}$ .

Supplier with strong nylon case. Thermistorally controlled heater and indicator amp. line core sold plug and instructions. Dimensions: 8.1 x 6.5 x 3" H. 11.5 x 17 x 8 cm. CSA approved. Heating blocks sold separately (see below).

Electrical Requirements	Cat. No.	Each
120V/50/60 Hz, 120W	11-715-102	223.58

**Interchangeable Heating Blocks for Isotemp® Dry Baths**

For Models 145 and 147 Dry Baths. Composed of black anodized aluminum alloy. Chemical resistant. Dimensions: 1 x 0.9 x 1.2" H. 1.0 x 2.3 x 3.0 cm.

The 11-715-123 block provides a safe, dry bath alternative for warming the Spalte of tissue loops. Avoids hazardous use of burners and inflammable nitrogen cylinders.

The 11-715-120 block is specifically designed to hold twenty 9.5 mm Bertho Diagnostics Placenta® pregnancy test tubes. This special shallow well block is similar to the other blocks with 0.9 mm holes, but sample wells are only 1/2" deep (1.0 cm) to meet test requirements. Wells in all other blocks are 1 1/2" deep (1.4 cm).

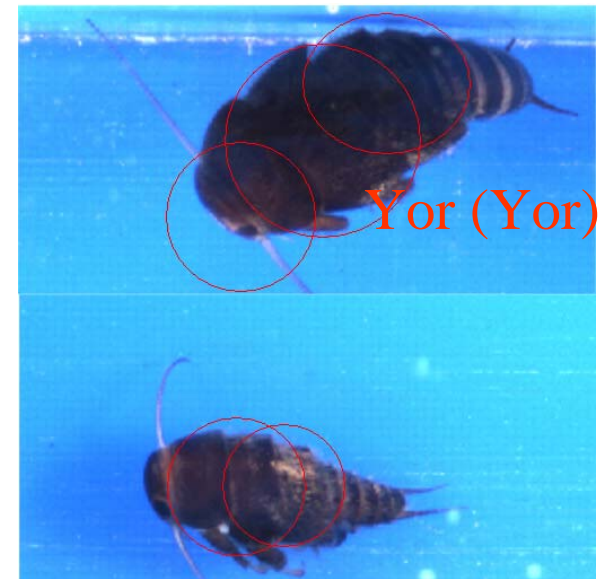


Tube Size, mm	Wells/Block	Cat. No.	Each
8	35	11-715-105	71.3
10	20	11-715-107	71.3
12	20 (var. low)	11-715-120	71.3
12	12	11-715-108	71.3
12.5	12	11-715-121	71.3
13	12	11-715-111	71.3
15	12	11-715-113	71.3
16	8	11-715-122	71.3
18	12	11-715-115	71.3
20	6	11-715-117	71.3
25	5	11-715-119	71.3

Incubator included. Forward heat-adjusted temperature control (see page 952).



# Science



## Classification Results:

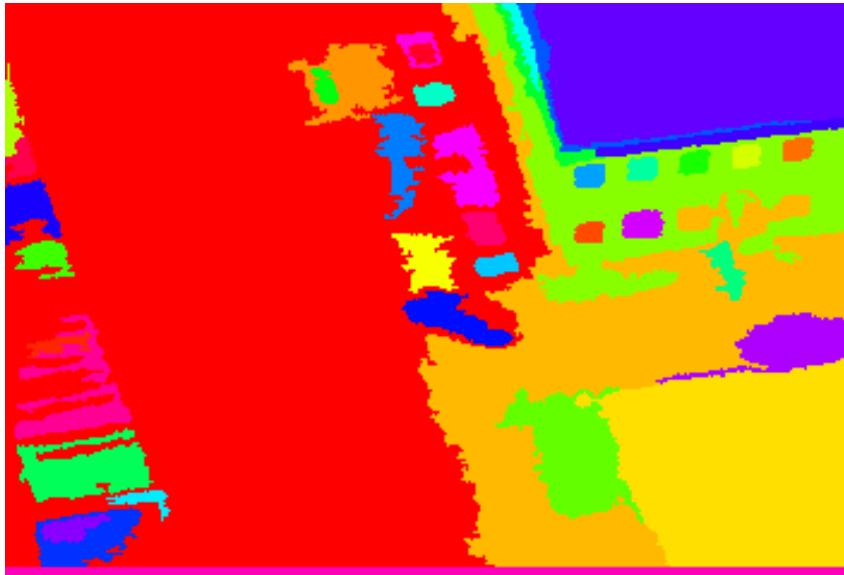
Classified	as Cal	as Yor
Cal	171	16
Yor	0	99

Classified	as Cal	as Dor
Cal	114	72
Dor	70	133

# Surveillance: Event Recognition in Aerial Videos



Original Video Frame



Color Regions



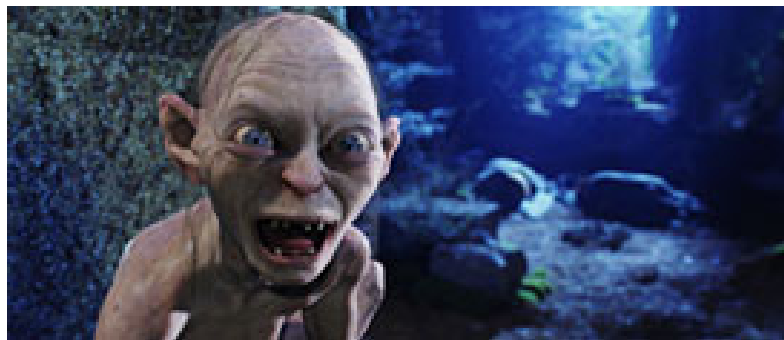
Structure Regions

# Face Detection (and Recognition)



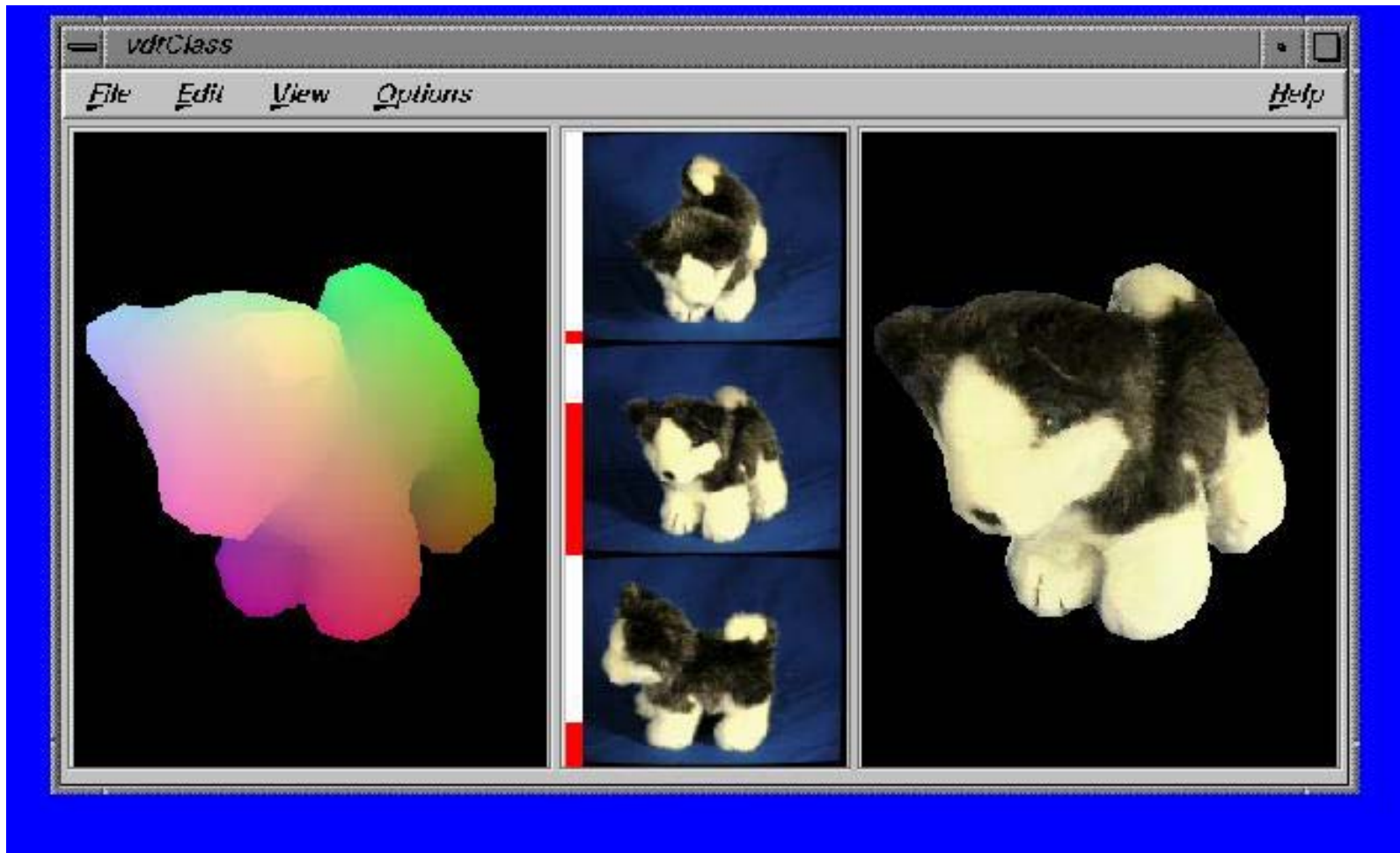


## Graphics: Special Effects



Andy Serkis, Gollum, Lord of the Rings

# 3D Reconstruction and Graphics Viewer



# Object Recognition from “Parts”

Part 1 – Det:5e-18



Part 2 – Det:8e-22



Part 3 – Det:6e-18



Part 4 – Det:1e-19



Part 5 – Det:3e-17



Part 6 – Det:4e-24



Background – Det:5e-19



Motorbike shape model

