

Talk: Practical Image Processing

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Capturing

Camera(s)

Processing

Computer(s)

Purpose here:

Detecting a fiduciary feature as part of a large scale AR-system.

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Common task:

Detecting a feature as part of an image by determining its shape and size.

The ball is clearly marked with a red circle, indicating that the ball's shape and size are detected.



Markerball with GPS (Bluetooth)

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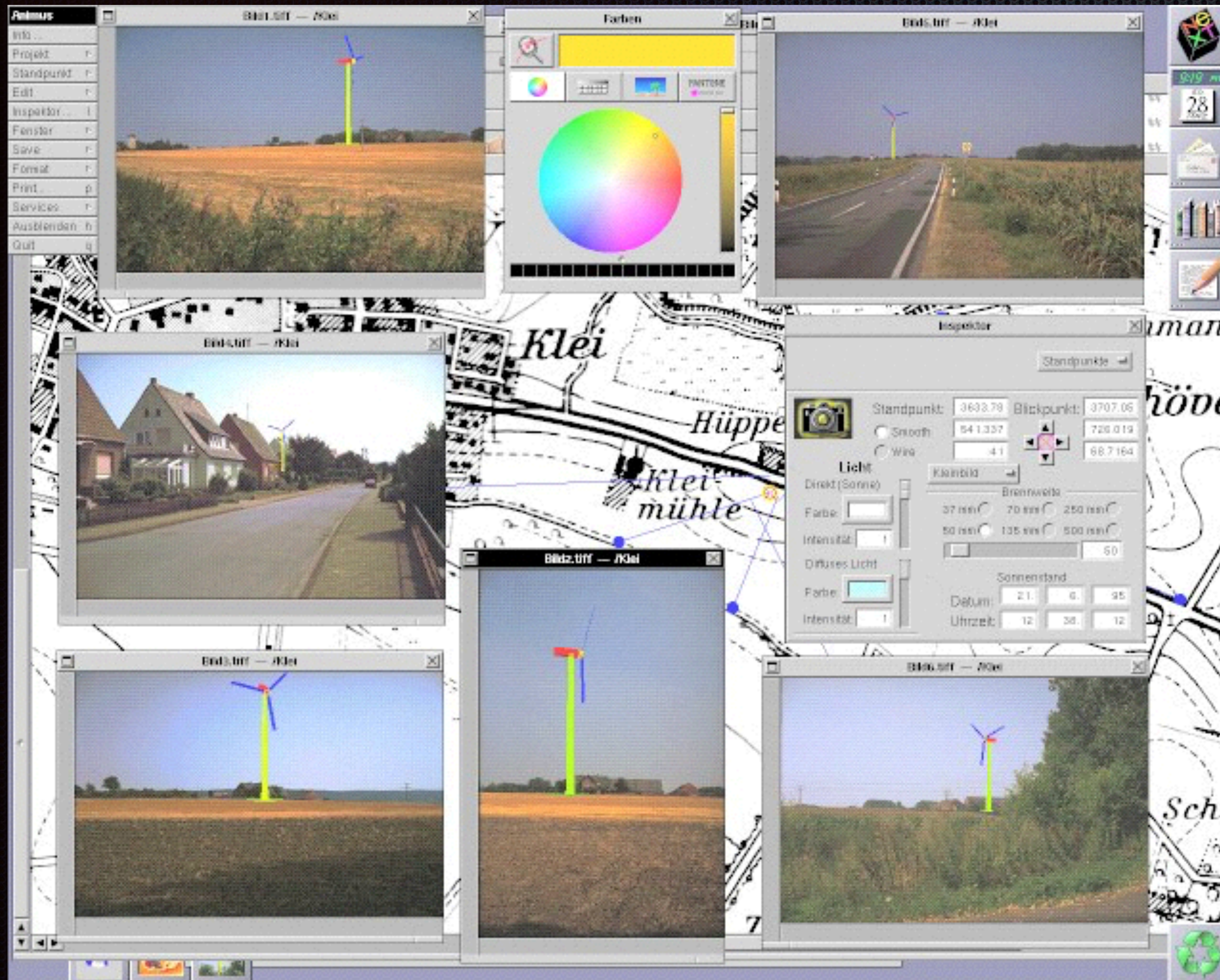
Capturing

Photo-CD
Scanner (BW)

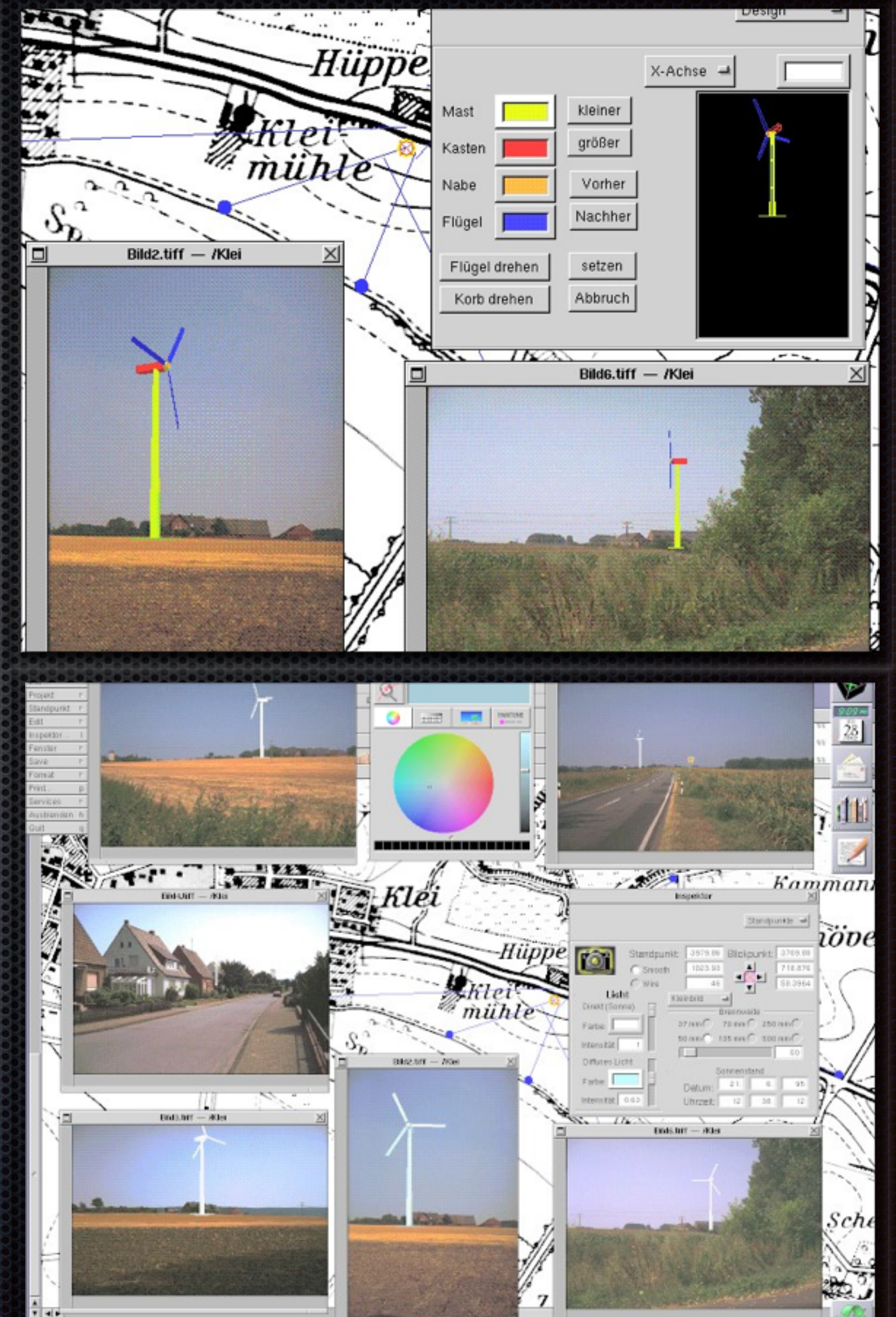
Processing

Almost none
NeXT

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Making colorful windmills (Why not?)



[1996 on NeXT]

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The original Photo-CD with thumbnails, loaded twice!

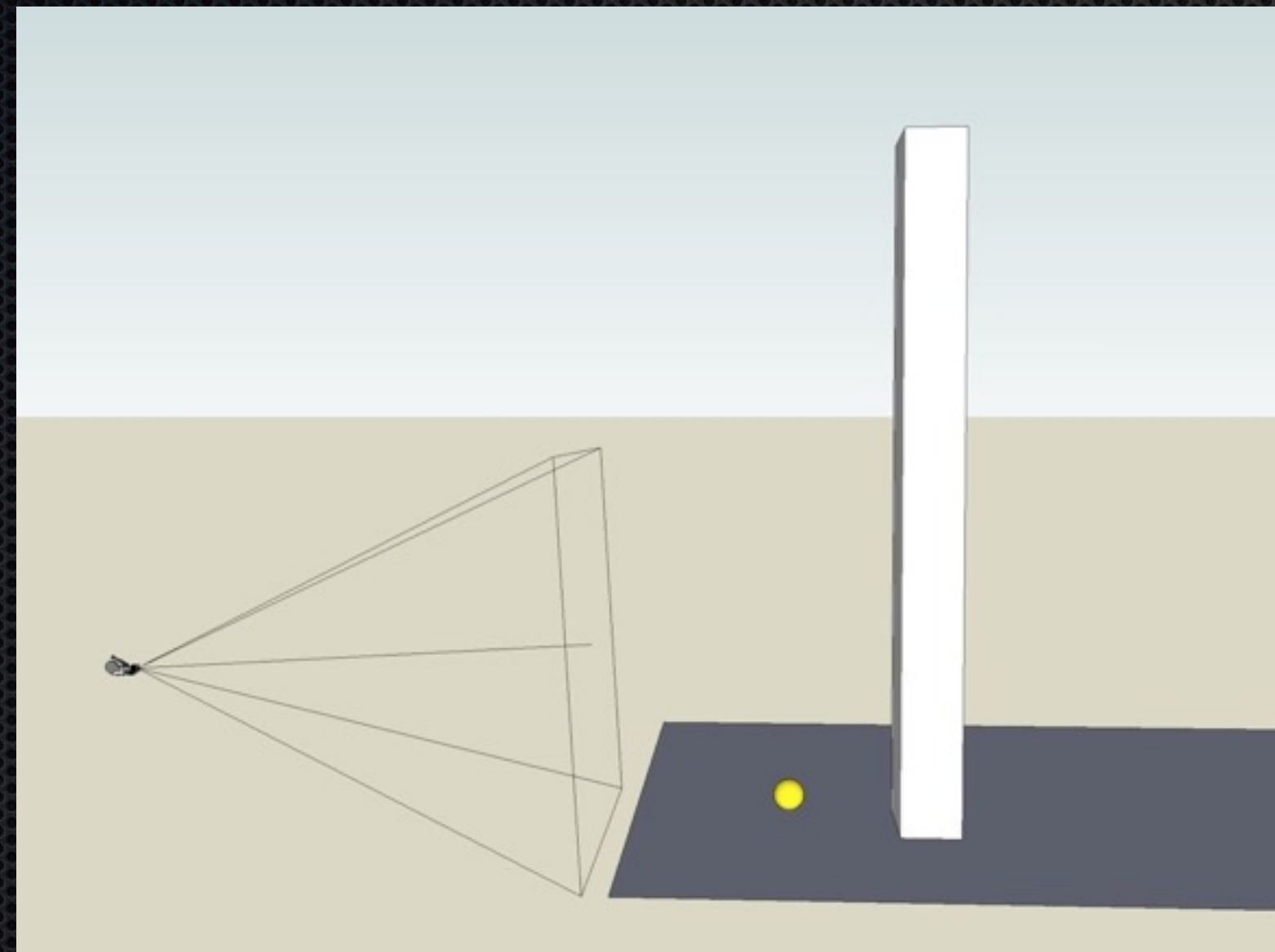


[1995/96, external CD]

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Slide from 2012

Marker and Tracking based AR



Principle
Setup

Camera with viewing volume, model and fiduciary feature

USP No. 7391424

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Capturing

Camera-USB
DV-Camera
external iSight

At that time the system was almost complete.

(USP No. 7,391,424)

Processing

Quicktime
Cocoa
(NSBitmapImageRep)

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Markerball with GPS (Bluetooth)

[2005]

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Setup with ball, cameras, GPS-receivers and laptop.



[2005 on Mac, PB G4]

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Movie ?



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Apple introduced CoreImage
mostly for effects

website

around 2006/7

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Apple introduced the iPhone

Capturing

Processing

iPhone-Camera

iPhone

(CoreGraphics, Open GLES)

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The iPhone
changed it all:

Built-in camera and GPS,
but no real image processing

and:

Built-in maps



around 2009/10

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On iOS, CoreImage was not available until 2012 with iOS 5

Third party:

Qualcomm introduced an SDK

Brad Larson GPU-Image

[website](#)

[around 2011](#)

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Schachtzeichen (Exhibition 2010)



(Big Marker Ball 2011)

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On iOS, CoreImage is still limited.
CIDetector detects only faces

OpenCV fills in the gap \Rightarrow demo later here

Multiple cameras (example)

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Escaping the paradigm

Capturing

Processing

Pixy -camera

The Hydra

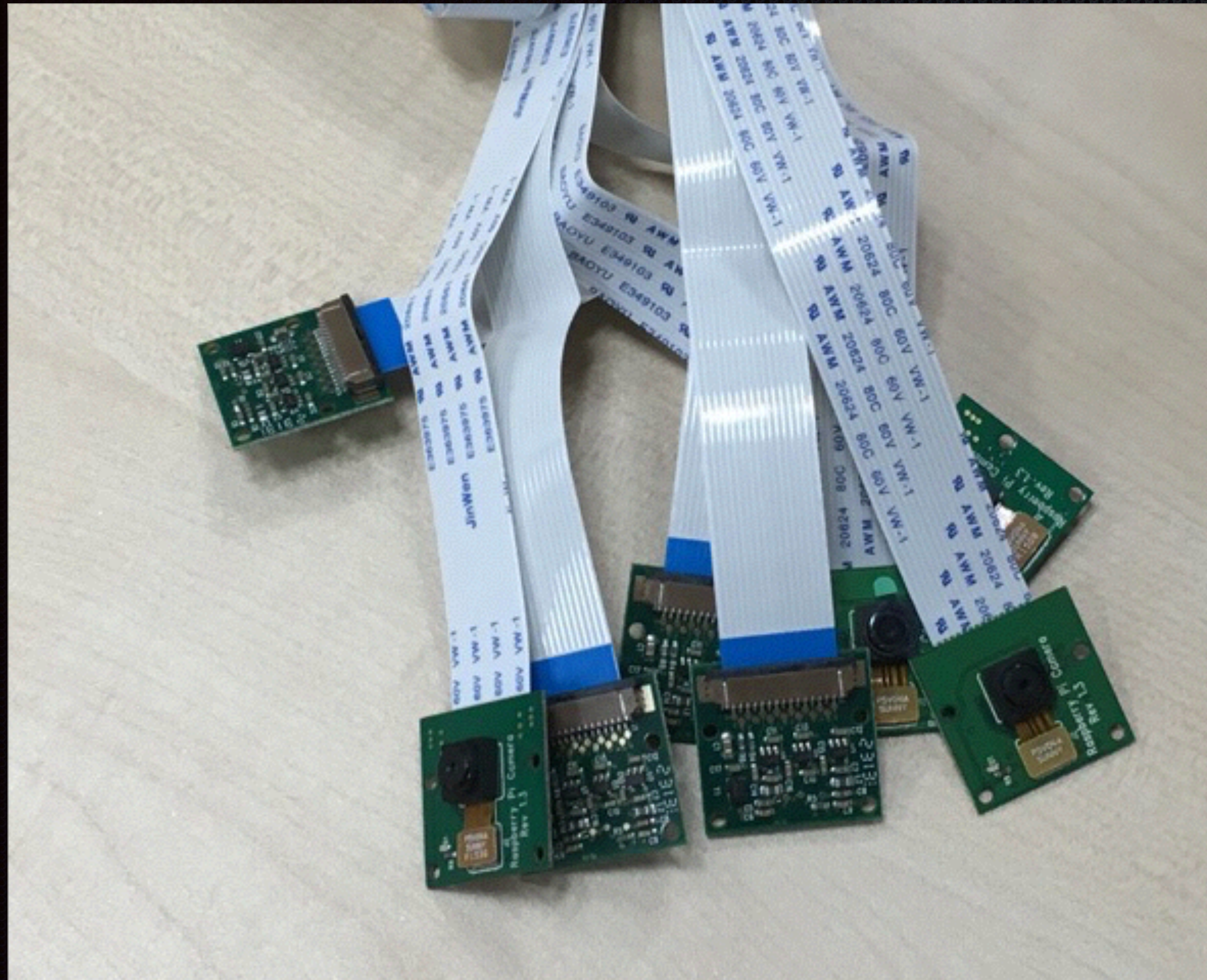
Demo:

Pixy -camera, Hydra

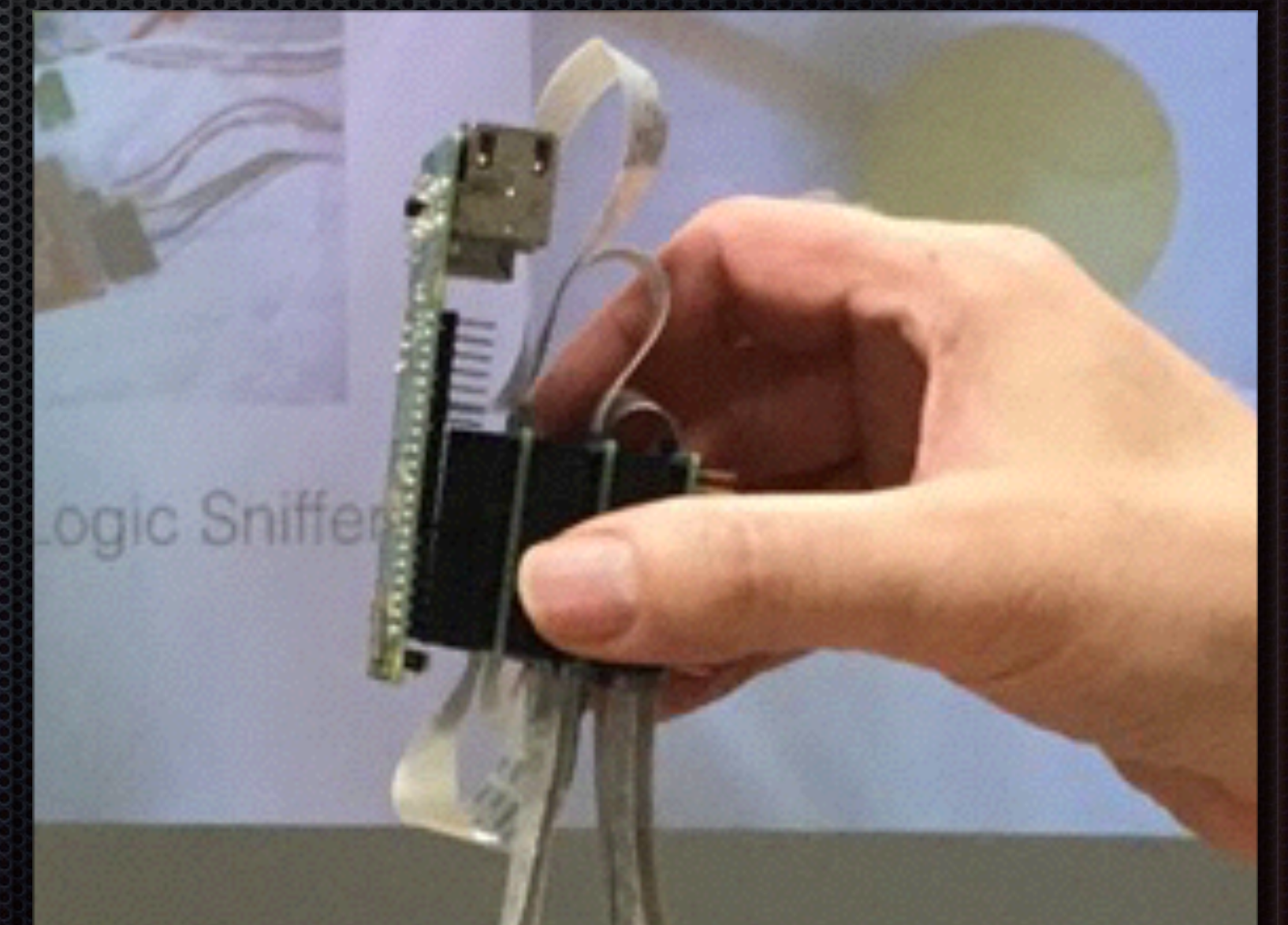
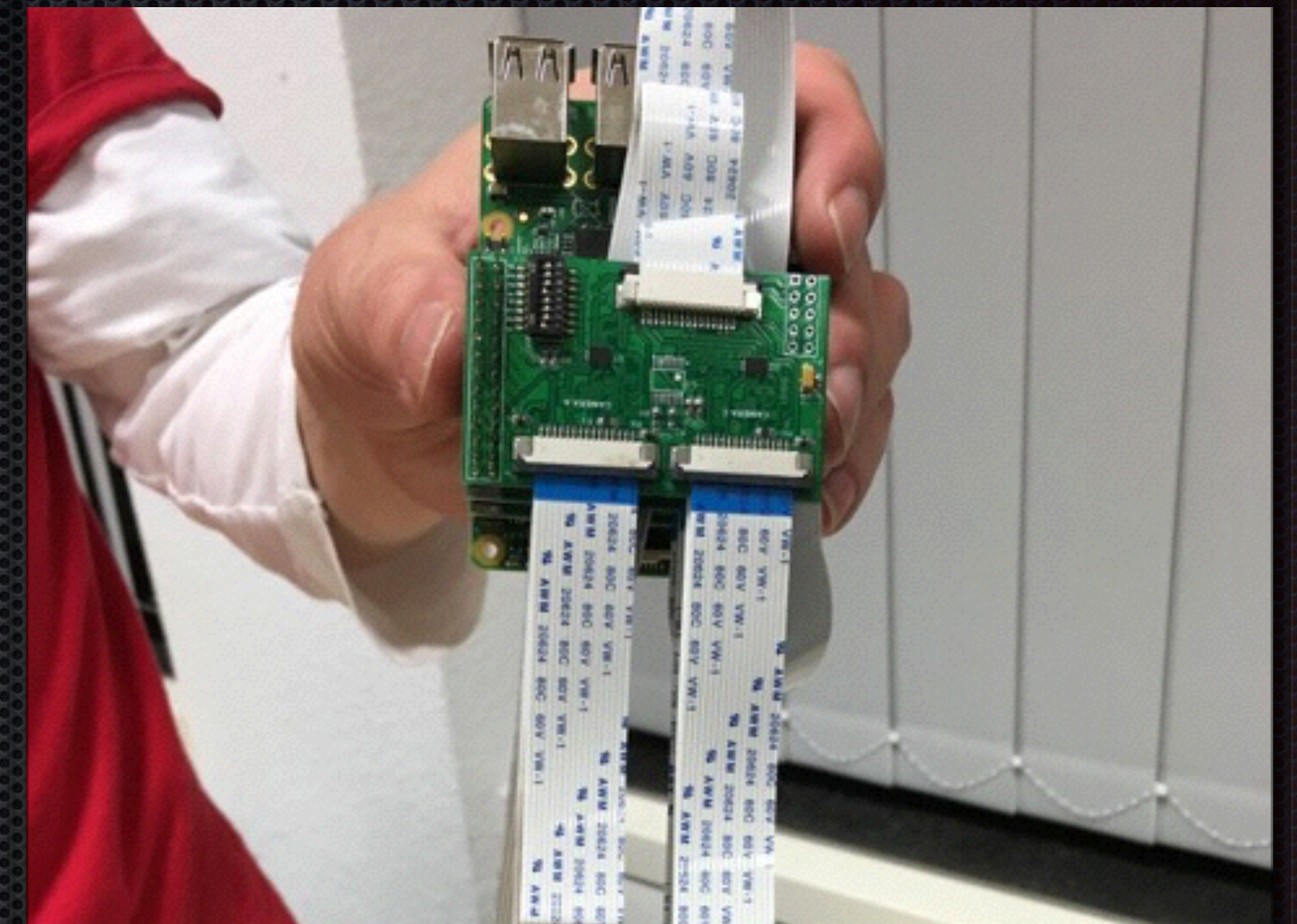
[website](#)

2016

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The Hydra: 12 cameras on a Raspberry-Pi

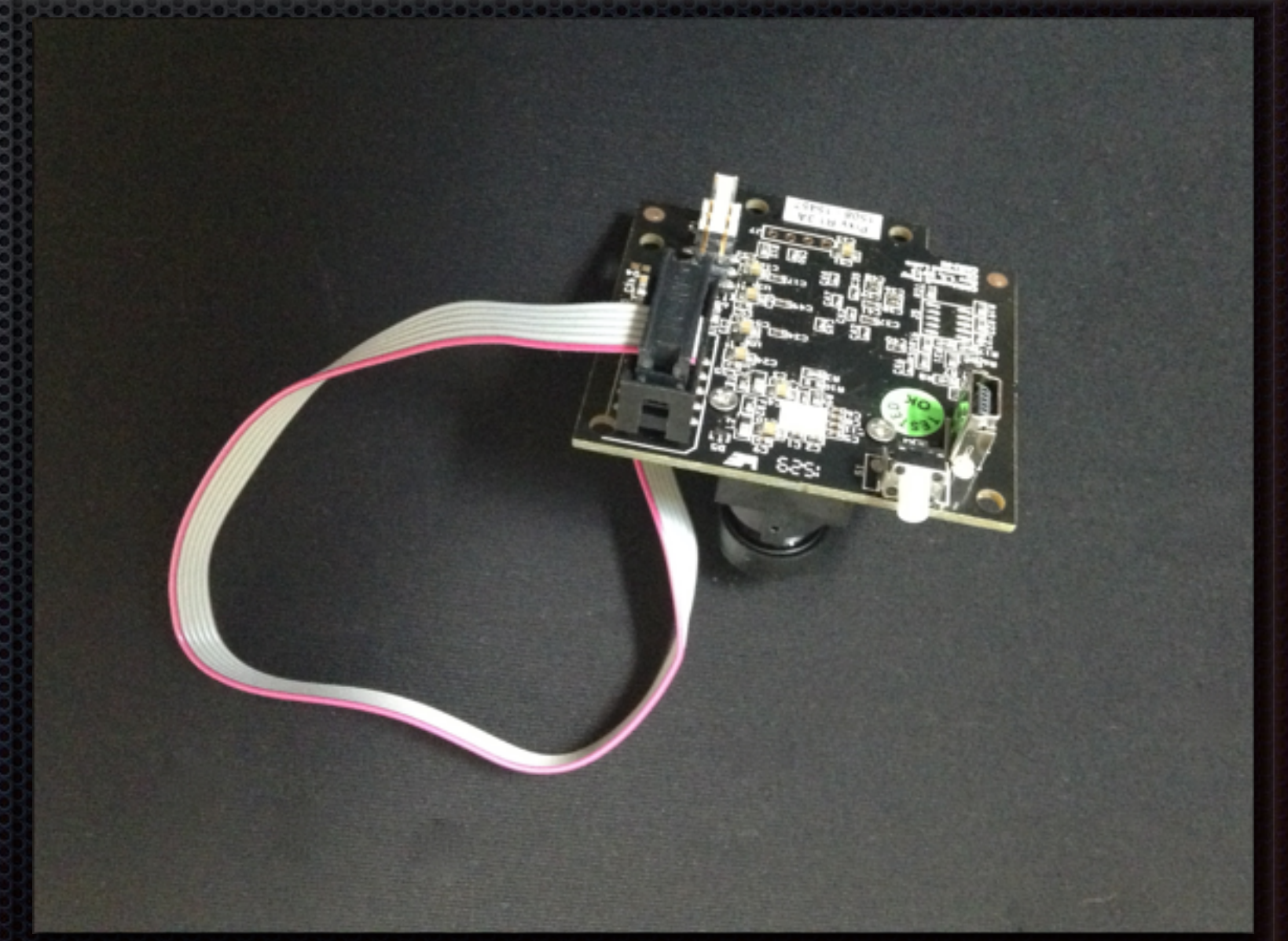
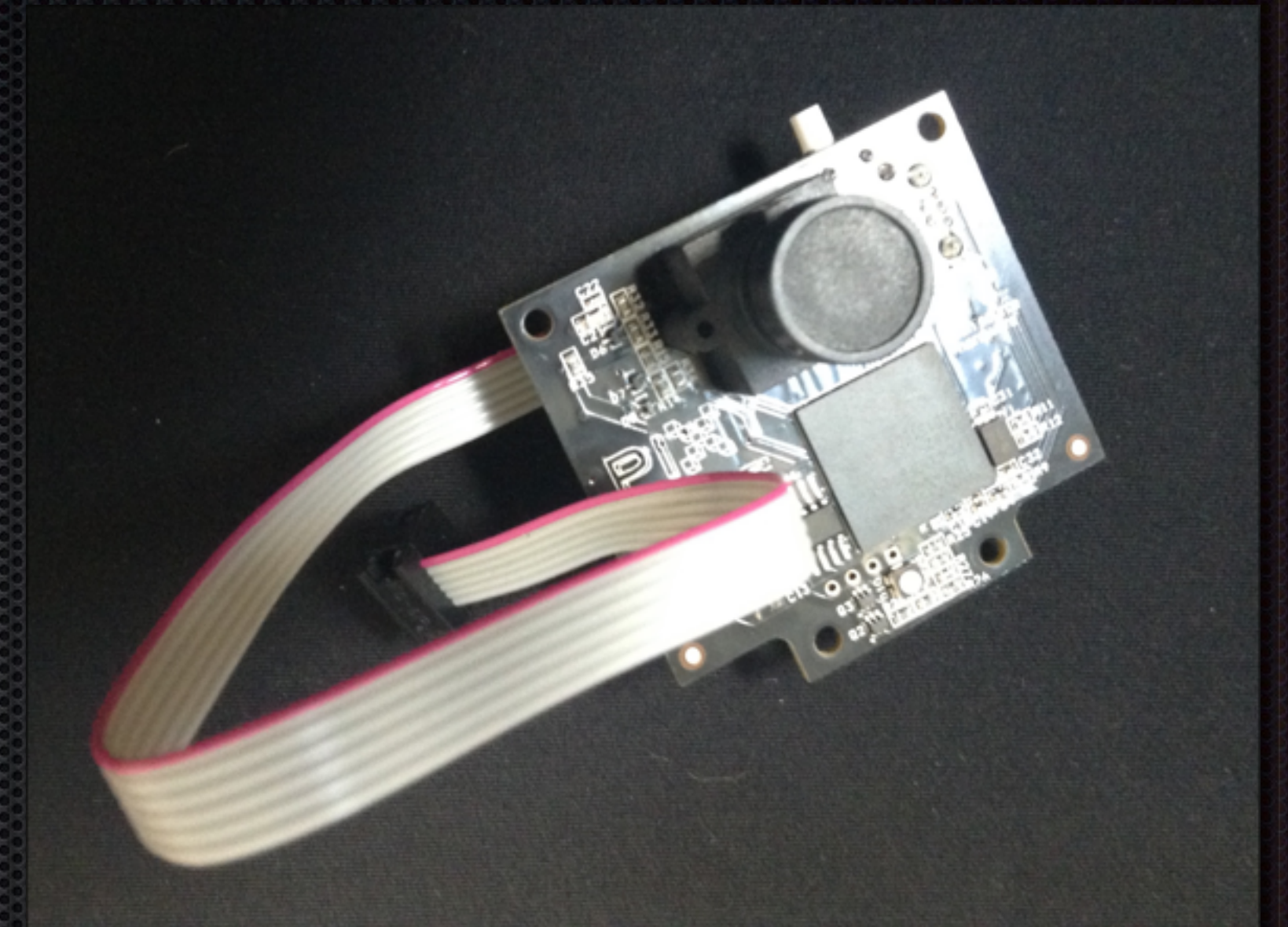


[2016 work in progress]

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Pixy camera: image processing on board



[2016, work in progress]

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Outlook



Fiduciary features everywhere

Thank you.