# Vision 2
# A Proposed Design

Rob Probin, April 2014

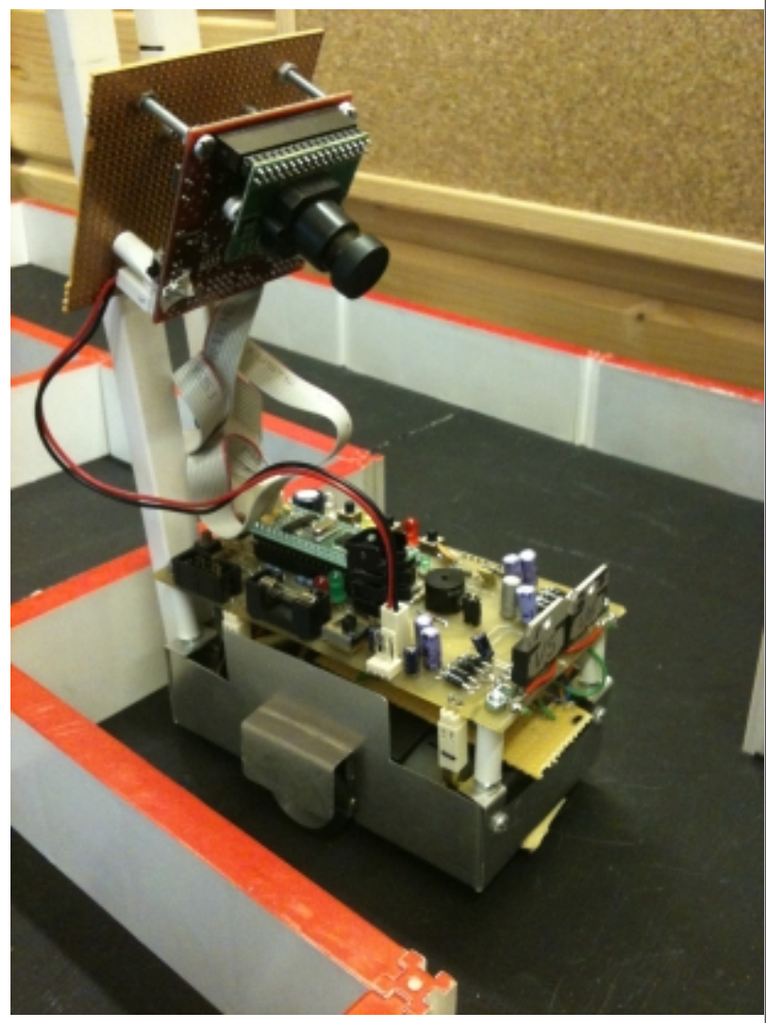
(Based on discussions between Rob Probin & Alan Henness since 2010)

MINOS 2014
at Millennium Point in Birmingham on April 26th

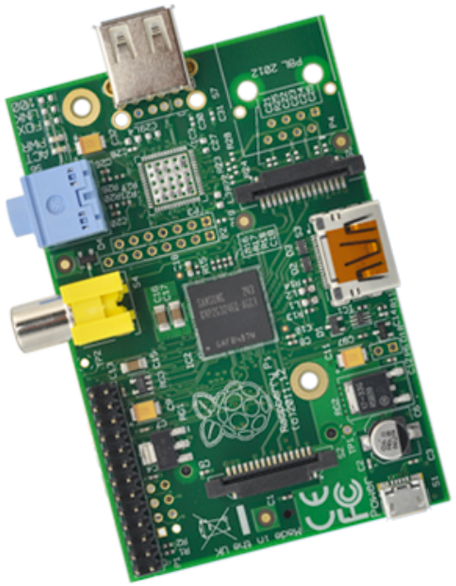
v1.4

# Problems with *1Vision*

- Not going straight
  - Weight, Software?
- Processing power & RAM not ideal
  - Two LPC2106
  - Vision on 60K RAM, 59Mhz CPU clock
- Camera resolution ‘VGA’
  - Actual 320x240 = accuracy+precision poor



# Concept



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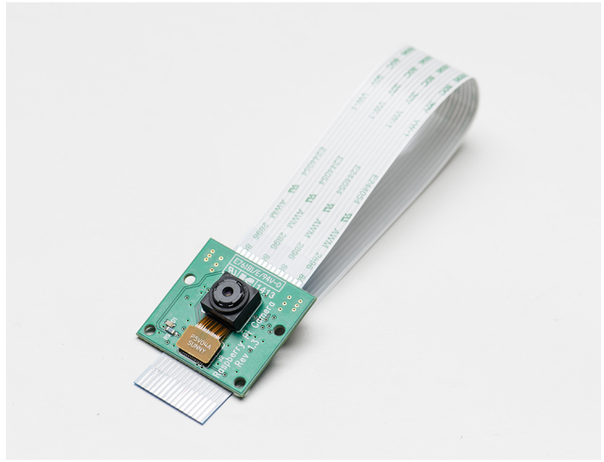

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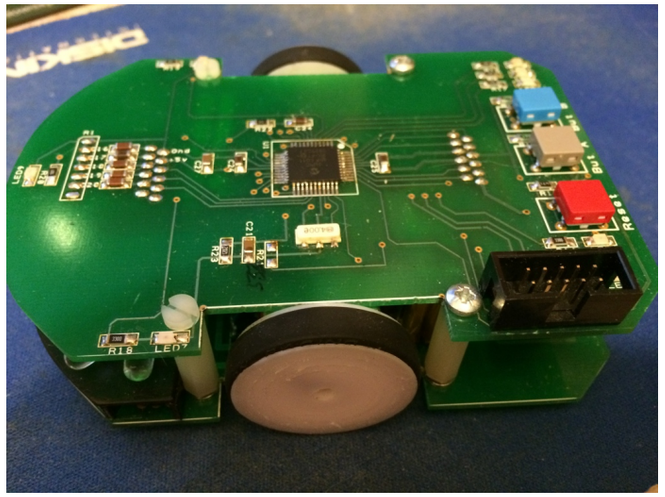
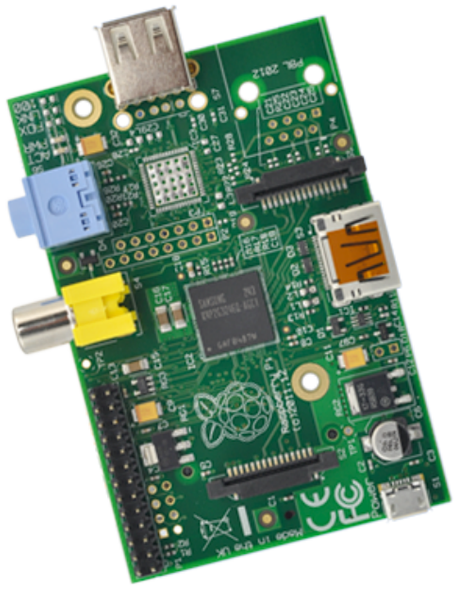


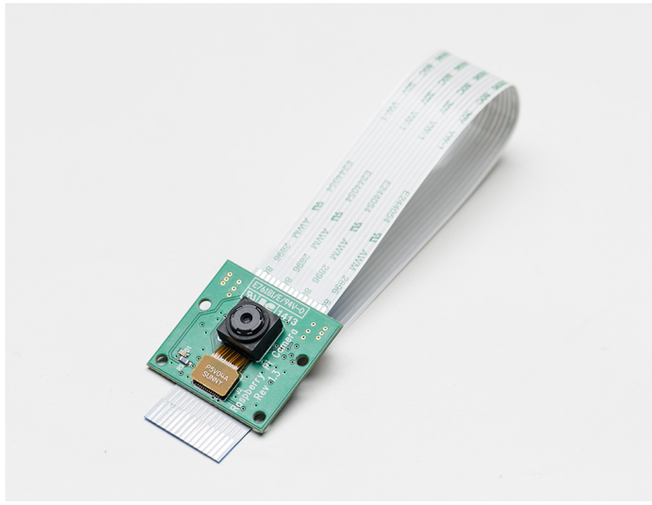
Includes I/O processor

+ Minimal plastic support

# Specs



- Raspberry Pi model A
  - 256 MB, ARM1176JZF-S (ARMv6k) 700 MHz



- Raspberry Pi Camera
  - 5 megapixel
  - 2592 x 1944 pixel static images
  - 1080p30, 720p60, 640x480p60/90 video

# Why Model A?

- 352mA - Model-B running stress test (for ARM)
- 330mA - Model-B idle

- 143mA - Model-A running stress test (for ARM)
- 110mA - Model-A idle

http://www.raspberrypi.org/forums/viewtopic.php?p=164893

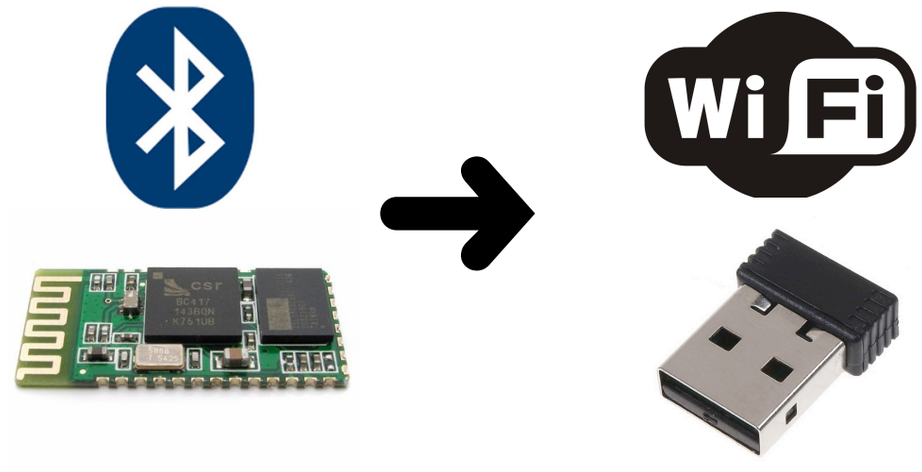
# Software

- Raspberry Pi
  - Vision Processor (reuse from 1Vision)
  - Maze solver
- I/O Processor
  - I/O
  - Timing Critical (avoid RT Linux drivers)

# Programming Language

- Raspberry Pi
  - Any programming language on the planet?
    - e.g. Lua, Python ...
  - Something compiled for the front-end vision?
    - e.g. C/C++
- I/O processor
  - C/C++ for the seems logical

# Debug Options



# Outstanding Questions

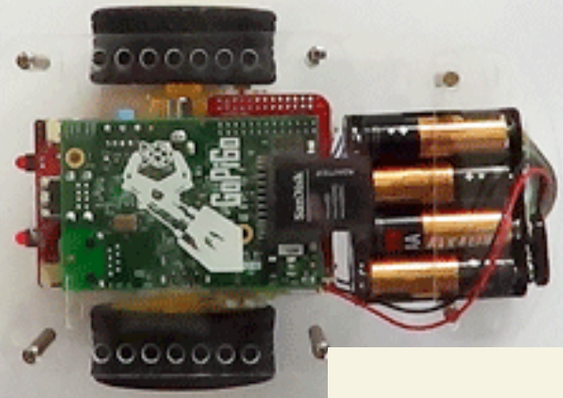
- Standard camera or NoIR?
- 5 V Regulator for Raspberry Pi?
- Interprocessor Comms (SPI, I2C, UART)

# Old ideas

(1Vision)

- Mount camera horizontal with mirror?
  - rather than vertical
- Headlights
- Line follower mode

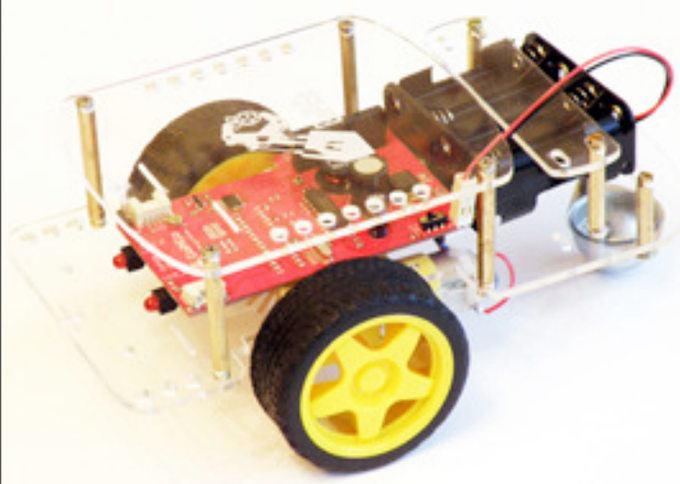
# The GoPiGo

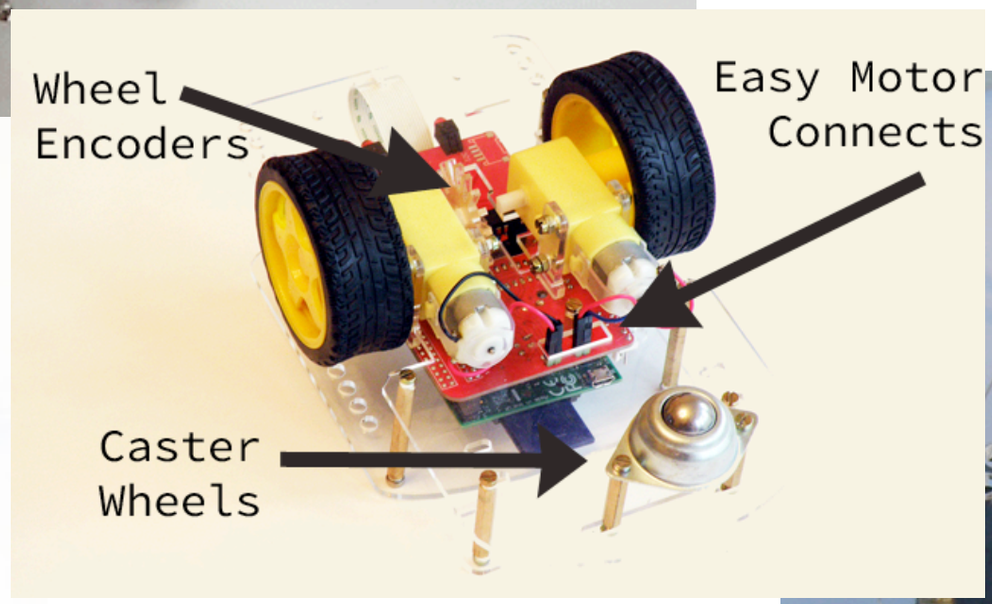


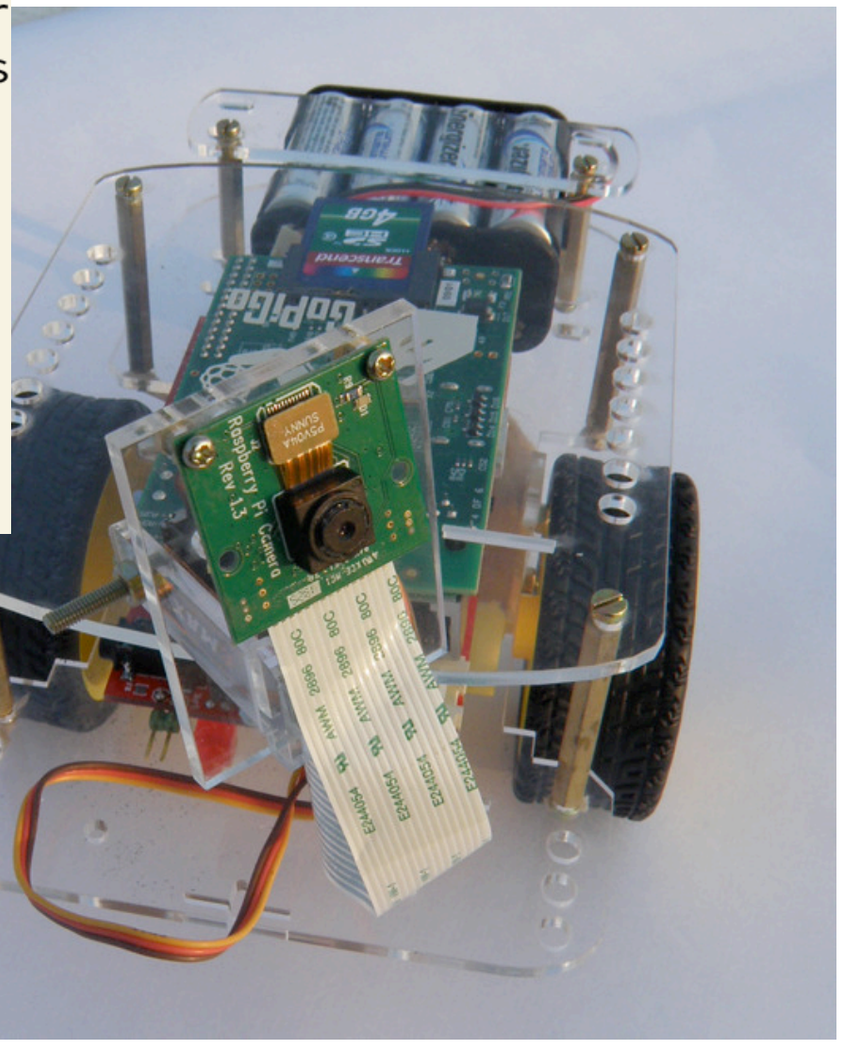
KICKSTARTER

Basic $84

+Camera Servo $119



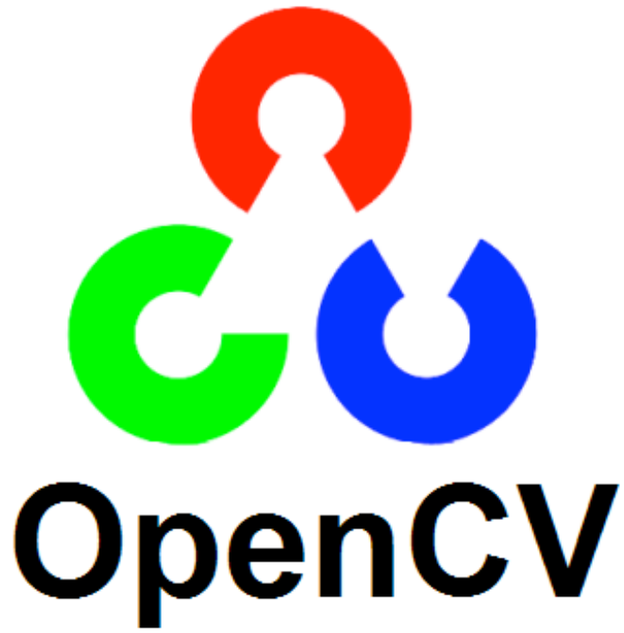


open-source hardware & software

# Motion Hardware?

http://www.raspberrypi.org/vectors-from-coarse-motion-estimation/




OpenCV's application areas include:

- 2D and 3D feature toolkits
- Egomotion estimation
- Facial recognition system
- Gesture recognition
- Human–computer interaction (HCI)
- Mobile robotics
- Motion understanding
- Object identification
- Segmentation and Recognition
- Stereopsis Stereo vision: depth perception from 2 cameras
- Structure from motion (SFM)
- Motion tracking
- Augmented reality

Includes a statistical machine learning library that contains:

- Boosting (meta-algorithm)
- Decision tree learning
- Gradient boosting trees
- Expectation-maximization algorithm
- k-nearest neighbor algorithm
- Naive Bayes classifier
- Artificial neural networks
- Random forest
- Support vector machine (SVM)

# Questions, Comments?