

Nashua Robot Builders
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Nashua NH



Cheap Cameras

Purpose
Approaches
Results so Far.

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Purpose

- **Low cost camera for Beagle, PI, Pine64, or similar.**
 - **Maybe even ESP8266 or Arduino?**
- **To support remote control or telepresence.**
 - **Stream video to a remote device via WiFi.**
- **Possible SLAM or just obstacle avoidance later.**
 - **Not considered yet.**

Option 1: USB cameras

• Pros

- **Easy to use.**
- **Often include microphones or built-in compression.**
- **Standardized USB Video Protocol.**
 - Built-in drivers on most Linux systems.
 - Most newer cameras use it.
 - Some old ones use proprietary protocols instead - YMMV.

• Cons

- **Bigger.**
- **Pi and others already have camera ports - Why add USB complexity?**
- **Cost?**
- **Some use USB standards, but proprietary image format.**
- **Resolution specs may be "optimistic": interpolated - read carefully.**

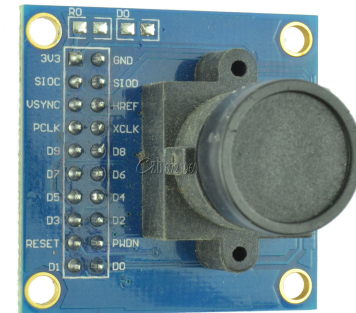


Option 2: Little cameras

- Most use Omni Vision <http://www.ovt.com/image-sensors> sensors.
 - ovt.com lists many (100's?) of versions.
- I bought modules with 3:

OV7725	20 pin header	640x480	\$10.98
OV7670	24pin flex	640x480	\$2.62
OV5647	15pin flex	2592x1944	\$8.54

- **OV7725** said to be compatible with Arduino or ESP8266:
 - www.arducam.com/tag/esp8266/
 - Has manual focus.
 - Not tested yet.
- **OV5647** sold as equivalent to Raspberry PI camera (and it works).
- **OV7670** was interesting because it's so cheap.





OV5647 15pin Pi

• On Raspberry Pi:

- `raspistill -o image.jpg;#`
captures 2592x1944 still image.
- `raspivid -t 10000 ;#` displays
video on Pi.
- Streaming:
- PC: `nc -l -u -p 5001 thePi |`
`mplayer - -fps 20 -cache 1024`
- Pi: `raspivid -n -w 854 -h 480`
`-fps 20 -t 9999999 -o - | nc -u`
`thehost 5001`





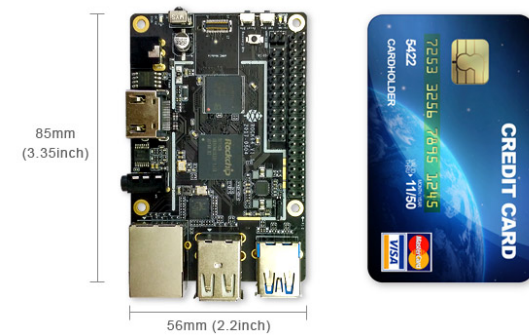
OV7670 24pin <\$

- Many vendors on eBay, banggood, and other places sell identical-looking modules.
- **NOBODY** documents what the pinout is.
 - It's obviously not PI-compatible.
 - Appears to just connect the camera chip balls to the flex cable.
 - No other electronics.
- pine64 www.pine64.org and Orange Pi www.orangepi.org have connectors that **appear** compatible.
- One school project reverse-engineered them:
 - project-archive.inf.ed.ac.uk/msc/20141607/msc_proj.pdf
 - They appear to be consistent with pine64/Orange PI.
 - Stay tuned ...

Related: Pine64

- **Products include**

- **Pine64 - Allwinner 1.2GHz quad core, 1GB DDR3, 1G Ethernet, etc. \$19.00**
- **Rock64 - Rockchip quad core, 1GB DDR3, 1G Ethernet, 5 Gb/s USB3! \$24.95**
- **Other versions with more or less ram.**
- **Per the USPS, mine are somewhere east of Chicago.**



Totally Off-Topic

- **From Econ 101: Perfect competition is: https://en.wikipedia.org/wiki/Perfect_competition**
 - **Many buyers and sellers of a product - no individual can influence the price.**
 - **No barriers - vendors can open or close at will.**
 - **etc.**
- **Then prices are driven to the "natural price".**
 - **Price too low: go out of business.**
 - **Price too high: other sellers will undercut.**
 - **Price will stabilize at just enough profit to stay in business.**
- **Is Shenzhen an example of almost perfect (Capitalistic) competition???**