

# The Raspberry Pi

# About Me

- Been teaching at the NCCA since 2003
- Background in Computing and Electronics
- Mainly teach Programming and Mathematics
- Main Interests realtime computer graphics programming and the teaching of Programming / Graphics

# Contact

- Email : [jmacey@bournemouth.ac.uk](mailto:jmacey@bournemouth.ac.uk)
- Web : <http://nccastaff.bournemouth.ac.uk/jmacey/>
- Blog : <http://jonmacey.blogspot.co.uk/>

# Introduction

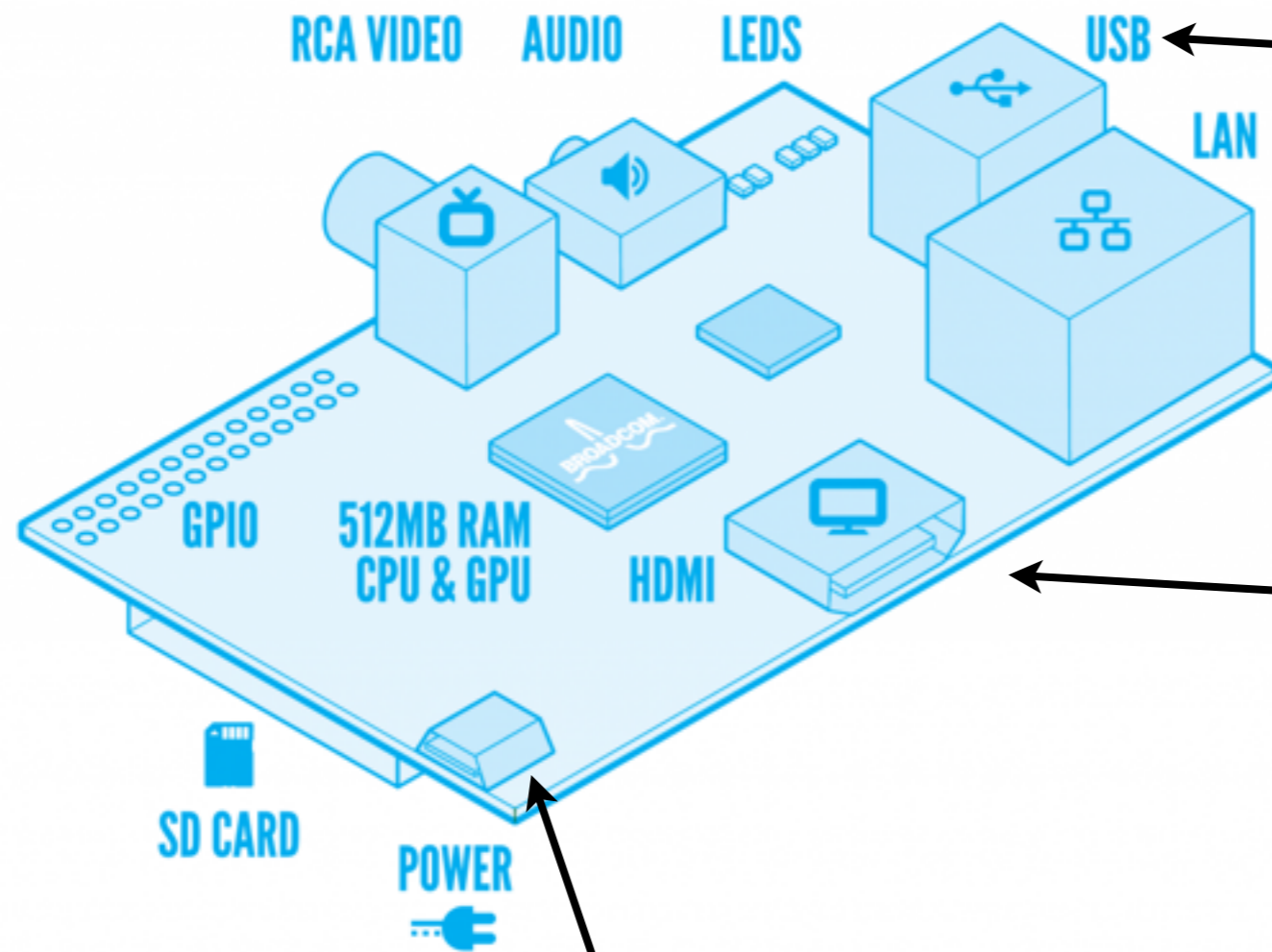
- What is the raspberry pi
- Hardware
- Operating Systems
- Software
- Examples
- Additional Hardware
- Support
- Projects

# The Idea

- The Raspberry Pi Foundation is a UK registered charity (Registration Number 1129409)
- It is a small, cheap computer aimed at children
- The idea is to give schools an ideal platform to teach STEM subjects
- To help bridge the skills gap in current ICT curriculum in the UK

# Basic PI

## RASPBERRY PI MODEL B



USB Connect  
Keyboard and  
Mouse

Connect HDMI to  
Monitor or TV

Mini USB for  
Power

# Hardware

- The PI uses a SOC (system on chip)
- Broadcom BCM2835 (CPU, GPU, DSP, SDRAM, and single USB port)
- CPU 700 MHz ARM1176JZF-S core (ARM11 family, ARMv6 instruction set)
- GPU Broadcom VideoCore IV @ 250 MHz (OpenGL ES)
- SDRAM RAM 512 MB shared with CPU / GPU and user configurable

# Hardware

- 2 X USB Ports
- 10/100 Ethernet (8P8C) USB adapter on the third port of the USB hub
- 3.5 mm Audio jack and audio via HDMI
- Composite Video / HDMI output
- GPIO system for user programmable I/O



# Overclocking

- It is also possible to overclock the CPU
- "None"; 700 MHz ARM, 250 MHz core, 400 MHz SDRAM, 0 overvolt,
- "Medium" 900 MHz ARM, 250 MHz core, 450 MHz SDRAM, 2 overvolt,
- "High"; 950 MHz ARM, 250 MHz core, 450 MHz SDRAM, 6 overvolt,
- "Turbo"; 1000 MHz ARM, 500 MHz core, 600 MHz SDRAM, 6 overvolt

# Raspbian “wheezy”

- This is the default operating system
- It is perhaps the easiest and most well supported
- There are other different operating systems each have their own advantages
- There are also dedicated images for things like media players (raspbmc)

# raspi-config

- A program that allows us to “tune” the pi
- can set memory split / overclock
- enable / disable features
- update / upgrade the OS
- must be run as the “root” user as modifies the operating system

# SD Card

- The main operating system / bootloader is stored on an SD card
- There are a number of different OS
- 4 - 32 Gb SD cards can be used but check with list of compatible ones
- Extra storage can be added via Network / USB HDD

# Different Raspi OS

- As SD Cards are cheap we can have many different OS's and change when we need to
- Just need to image each card
  - Pidora (a version of Fedora Linux)
  - RISC OS
  - RaspBMC (a full media player)

# Programming

- The default raspbian image contains the following programming languages
  - C / C++
  - Python (python 2.x and python 3) as well as pygame
  - scratch

# NGL

- C++ library aimed at all levels from 2nd year undergraduate to MSc and PhD level
- Python bindings for easy prototype
- Compatible with OpenGL and Renderman
- Branches for iOS and Rapsbery Pi (OpenGL ES)
- Designed to teach important techniques of both graphics and programming
- Not optimised for speed, but easy to read and teaches “best practice”

# NGL

- Is released under the GNU open source library so anybody can use it for teaching.
- soon to be put on a redmine server for easy access to add bug reports and feature requests
- It has now been used for 8 years for all teaching and a number of student developed modules are in the code base
- New libraries being proposed focused on games development and user input (Kinect etc)



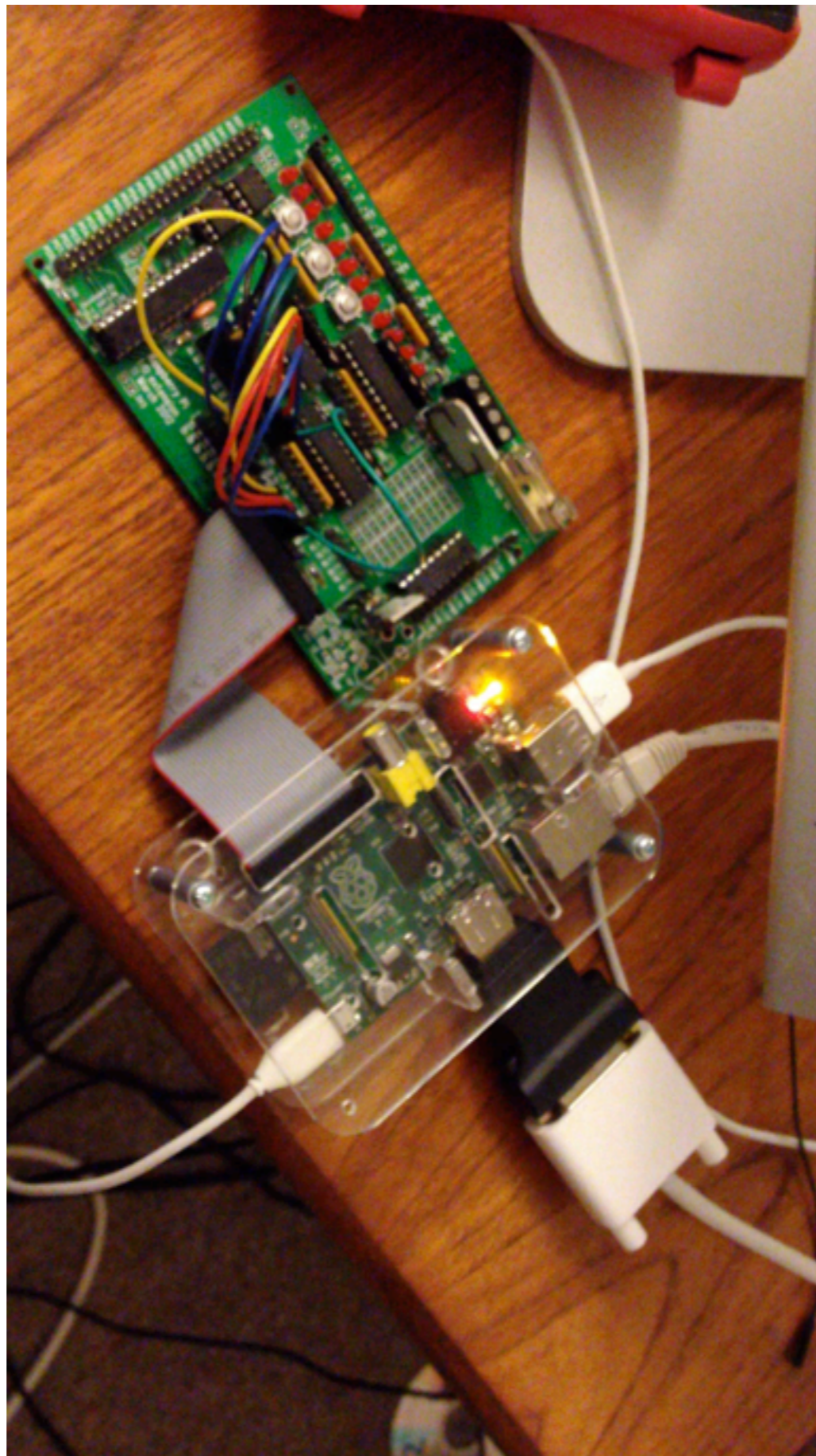
# NGL Demos

- <http://nccastaff.bournemouth.ac.uk/jmacey/GraphicsLib/Demos/index.html>
- Demos take a “cookbook” approach giving different “recipes” for coding algorithms and techniques
- Supported by blog and all code in version control
- Extensive documentation via lab notes and video demos

# Extension Boards

- There are many extension boards / accessories for the pi
- Camera Module (demo)
- piface (demo)
- gertboard (demo)





# Minecraft!

- yes it can play minecraft (pi edition)
- There is a strong community built around programming using python and minecraft
- <http://arghbox.files.wordpress.com/2013/06/minecraftbook.pdf>

# Project Ideas

- A simple Cluster <https://www.youtube.com/watch?v=Jq5nrHz9I94>
- In Space <http://www.youtube.com/watch?v=KGLB9-LdpYM>
- Led Cube <http://www.youtube.com/watch?v=S6P3jcxKh-k>
- Retro Gaming <http://www.youtube.com/watch?v=tm6nI26Mp5E>

# References

- <http://www.raspberrypi.org/quick-start-guide>
- <http://trevorappleton.blogspot.co.uk/2013/03/keeping-your-raspberry-pi-updated-with.html>
- <http://www.raspbmc.com/>