Raspberry Pis
Computational Thinking and Cyberscience

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Ti Leggett – Argonne Leadership Computing Facility
Choose your own adventure

Introduction - Computational Thinking and Raspberry Pi 3 – 21
• Continuation of Introduction

Computing Tracks
• Demo - Tiny Titan Supercomputing Demo
• Talk - History and Future of Supercomputing
• Demo – Machine Learning on an Rpi

CyberScience
• Hacking Demo 1 - DDOS demo
• Hacking Demo 2 - ARP Poisoning
• Alt – practice run for middle schoolers
Computational Thinking & Raspberry Pis

Discovering Problem Solving Using Computer Science

- Ti Leggett – Deputy Project Director & Deputy Director of Operations
- Argonne Leadership Computing Facility (ALCF)
Why computational thinking?
Problem Solving by Pattern Matching

• Critical skill, not just in computer science
• Break the problem down
  • What are you trying to solve?
  • What do you know/have?
  • Do you know what you don’t know?
    • How do you find out what you don’t know?
  • Do you notice any patterns?
    • After solution, can you simplify/optimize the solution further?
Examples

- Helping my son with math homework
- Assembling a wheelbarrow
- Building a house in Minecraft
My Story
Tools to help teach computational thinking
Software Resources

• MIT Scratch
  • http://scratch.mit.edu
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• Code.org
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• Alice
  • https://www.alice.org
What’s the difference?

• MIT Scratch
  • More open ended
  • Community based
• Code.org
  • Aligned with Common Core
  • Step by Step
  • Hour of Code
• Alice
  • Focuses more on visual and interactive
  • Not as widely used as other two
Hardware Resources

• Lab computers, laptops, & tablets
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• PINE64
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• Raspberry Pi
  • https://www.raspberry.org
What’s the difference?

• **BeagleBone, PINE64, & Raspberry Pi**
  • Full fledged computers
  • Run an OS
  • Programmed with many different languages
  • More general purpose
  • More easily use networks
  • Large amount of RAM

• **Arduino**
  • Microcontroller
  • No OS, what you “flash” on it is the only thing that runs
  • Great for “real time” applications
  • Low power & can be tiny

• **All have General Purpose I/O (GPIO)**
  • Sensors, motors, relays
Why the Raspberry Pi?

• It’s cheap: $35
• Works with common components
  • TV, keyboard, mouse, wireless, Bluetooth
• Updated versions regularly
  • Faster, more RAM, better I/O, etc.
• Flexible
  • Runs Windows & Linux
• Huge user community
  • Many existing projects and examples
• MagPi
  • Free to download monthly magazine
• Lots of accessories
  • Cameras, LCDs, sensors, cases
Introduction to the Raspberry Pi
GPIO Pins
USB Ports
Ethernet
Stereo Audio
HDMI
Micro USB Power
Programmable LEDs

Model

External Display Connector

Processor & GPU

Camera Connector
What do you need to get started?

- HDMI monitor or TV
- HDMI cable
- USB keyboard and mouse
- 8GB+ micro SD card
- SD card reader (your laptop may have one built in)
- OS image
- Software to write to the SD card
  - https://etcher.io/
- Micro USB power adapter
  - Many cell phone chargers will work
  - Make sure it is at least rated for 2.5A output
  - If in doubt, buy a UL rated one for a Raspberry Pi 3
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