AUBURN UNIVERSITY

SAMUEL GINN
COLLEGE OF ENGINEERING

AUBURN UNIVERSITY
K 12 INCLUSIVE STEM OUTREACH PROGRAMS

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History

- K12 Computer Science Outreach Program was founded in 2005.
- As of now it served:
  - Over 600 K12 students age 7-18
  - Over 200 students with special needs
- Demographic area: Alabama, Georgia, Tennessee
- Disabilities among campers included:
  - Down syndrome
  - Williams syndrome
  - Cerebral palsy
  - Repaired cleft palate
  - Autism & Asparagus
  - Hearing and visual impairments
  - Learning and cognitive disabilities

Alice Curriculum

- We have developed two Alice curriculum:
  - *Beginner Level* : for elementary school children as well as for children with mild learning or cognitive disabilities
  - *Intermediate/Advanced level* : for middle school, high school and gifted elementary school children

Project Expression

- ## Project Expression:
  - allows students to express their ideas, opinions, and beliefs by using multimedia, empowers students with the ability to communicate and educate via multimedia and the internet
  - involves training in Alice 2.2, Google Tools, Final Cut Express (Video and Audio), Green Screen techniques, and other advanced media and computer software related concepts
 - serves as an introduction to cloud computing file management, and basic networking.
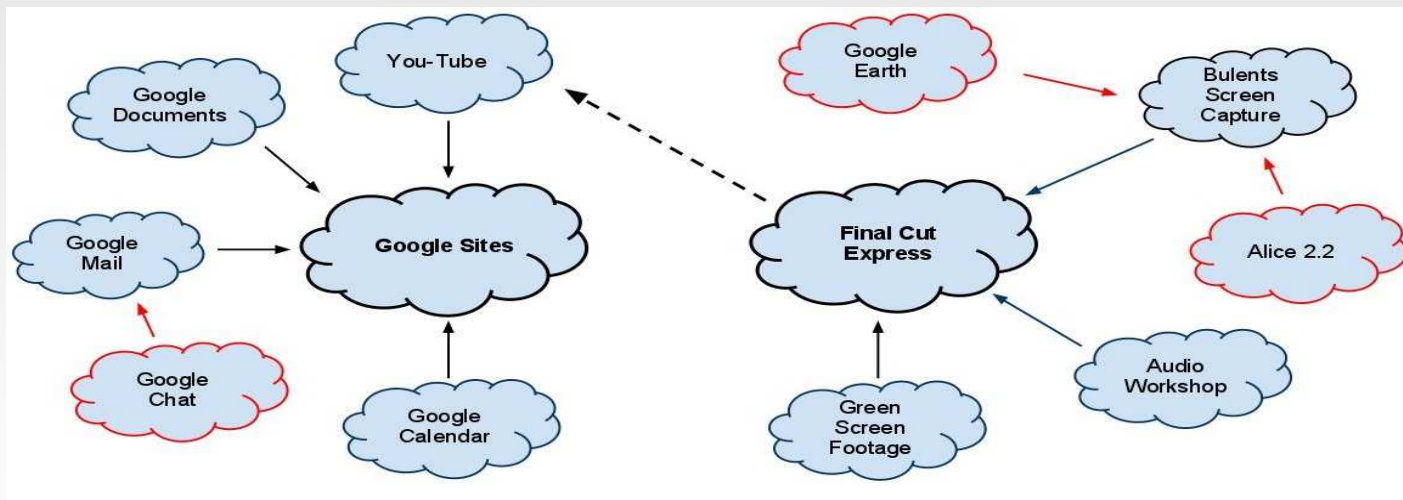
- ## A setback with the Alice environment is the inability to export Alice creations to a standalone executable or movie file.
  - Project expression has been a successful attempt to bypass this issue by using special software to extract the Alice data in the form of a movie file (.avi) and import it into a video-editing suite such as Final Cut Express.

Robotics Curriculum

- Lego RCX robots and the Robotics Invention System 2.0 RIS (visual programming language created specifically for programming Lego Mindstorms robots) were a good place for new/beginner level students to start learning the basics of robots programming
  - ✓ Programs may be created on a desktop computer using RIS, and they are then transferred to the robot using a USB infrared tower.
  - ✓ Programming and control structures are represented in RIS as Lego blocks, and their visual representations embrace the idea that form should follow function
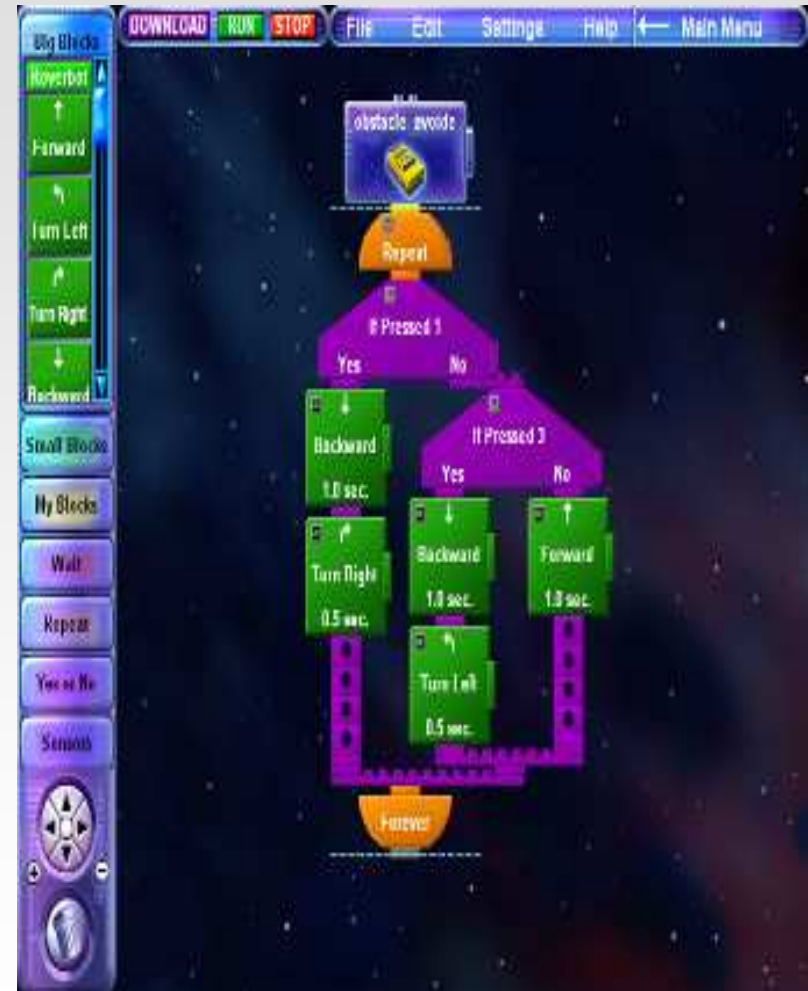
Microsoft Robotics Developer Studio

- Microsoft Robotics Developer Studio (RDS) is used in Robo Camp for students that have shown exceptional skills while working with the Lego NXT robots.
  - RDS allows students to quickly program robots using a visual development environment, or directly by using a complex C# programming language.
  - When working with RDS students have the option to program the real NXT robots or simulated robots in a virtual space.
- In the 2008 Robo Camp, students started to experiment, using the simulated environment, creating a specialized robot
  - Then, using input devices, such as Microsoft X-BOX 360 wired controller, they implemented wireless controlled robots race.
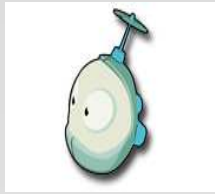
Microsoft Kodu

- Kodu is a new visual programming language made specifically for creating games (http://fuse.microsoft.com/page/kodu.aspx /).
  - It is designed to be accessible for children and enjoyable for anyone.
  - The programming environment runs on the Xbox and PCs, allowing rapid design iteration using only a game controller for input
- Kodu programming was used at Robo Camp, starting Summer 2009 to teach children basic programming concepts in a fun and interesting way.
  - Children used Xboxes, PC's with or without game controllers to create and program their games.

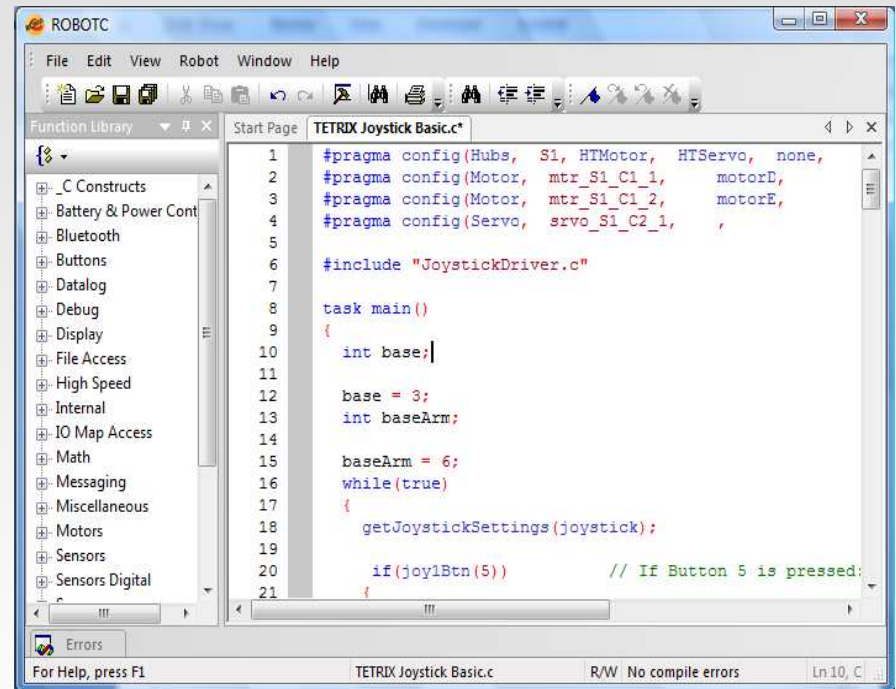# Lego Mindstorm Tetrix Curriculum

- The new Lego Mindstorm Tetrix robot includes:
  - Strong metallic based educational robot combined with a NXT robot
  - Two 12-volt DC motors featuring 152 rpm and 300 oz-in. of torque
  - Two 180 degree servos, a HiTechnic DC motor control and a HiTechnic servo controller.

- The NXT brick is used to program and control the Tetrix motors and servos.
- NXT sensors could also be used with the Tetrix
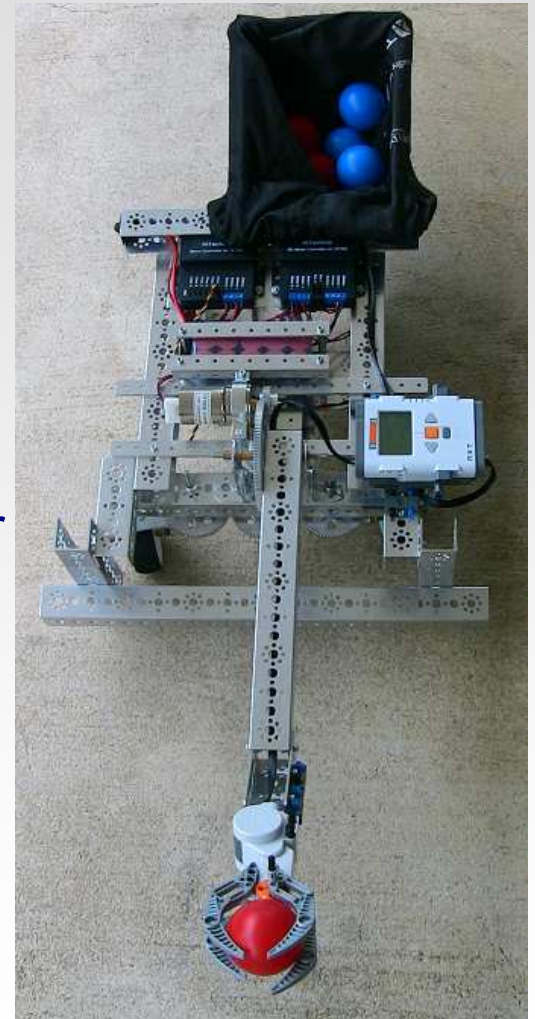
ROBOTC Curriculum

- ROBOTC is a Carnegie Mellon University C based programming language used to program the Tetrix.

- The NXT brick is loaded with a firmware to support the ROBOTC libraries.

- A Logitech Bluetooth Joystick is used to control remotely the Tetrix robot.

COMPUTER SCIENCE
Unplugged

- The CS Unplugged project exposes children to great ideas from Computer Science without having to use computers.
  - One unexpected benefit of the activities is that they provide social interaction while working with CS concepts, which isn't what people might expect from stereotypes.
  - CS emphasis is that the main point is not to teach CS, but to communicate what it is.
- Goals of "Unplugged"
  - Communicate what Computer Science
  - Create interest in Computer Science
  - Share great teaching ideas
  - Reach minority/disadvantaged groups
  - Decision makers: kids, parents, teachers
 - Have fun!

Alice, Kodu, Robotics & CS Unplugged

- ## Alice & CS Unplugged
  - Sorting Network
  - Binary Numbers
  - Public Key Encryption

- ## Kodu & CS Unplugged
  - Binary Numbers

- ## Lego Robots & CS Unplugged
  - Lego NXT and Binary Numbers
  - Tetrix Robot and Image Representation
  - Tetrix Robots & Sorting (implements the selection, insertion and quick sort algorithms)
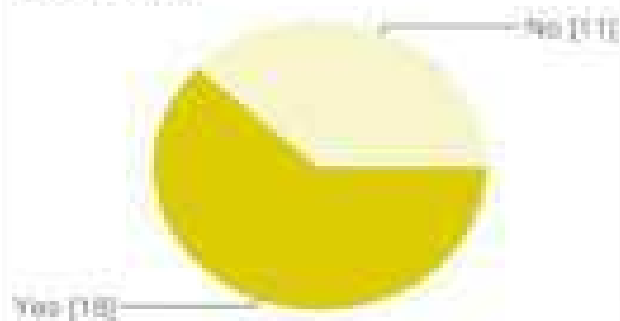
Results

Please rate how much the activity helped you to understand "Public Key Encryption"

It did not help   It helped a lot

Did you enjoy the "Public Key Encryption" activity?

No [8]
Yes [23]
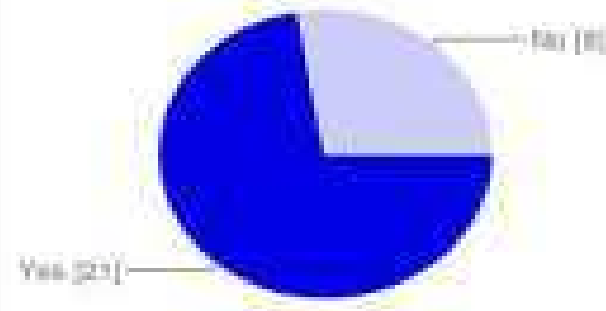
Did the activity help you make any connections between computers and real life?

No [11]
Yes [18]