

A large, semi-transparent background image featuring a LEGO Mindstorms NXT robot on the right and a block of code on the left. The robot is a white and grey humanoid figure with a screen on its chest and various sensors. The code block is a grid of colorful icons representing different functions like motion, sound, and logic.

# Welcome to the 12<sup>th</sup> UOIT Engineering Robotics Competition

Faculty of Engineering and Applied Science

<http://roboticscomp.engineering.uoit.ca/>



# UOIT Robot Competition 2017

- Program:
  - Welcome and Introductions
  - About UOIT and FEAS
  - Some Administrative Issues
  - About the Competition
  - Introduction to some design and the NXT/EV3



# Sponsors



- Faculty of Engineering and Applied Science
- UOIT Women in Engineering



# UOIT Robotics Competition Organizing Committee

- Dr. Mikael Eklund – Organizing Chair
  - Electrical Engineering Professor, Department of Engineering, Computer and Software Engineering
- Masoud Farzam and Leon Wu
  - Senior Lectures, Faculty of Engineering and Applied Science
- Michelle Tsui-Woods, Yasmin Abdulla
  - Administrative Support and Outreach Coordinators
- Joe Stokes – School Liaison Contacts
  - UOIT Admissions Officer, Registrars Office



# University of Ontario Institute of Technology

- Created by Ontario government June 27, 2002
- First new university in Ontario in almost 40 years
- Market-driven/career-oriented programs
- Strong focus on technology in education
- Laptop computer university
- Publicly funded
- Enrollment:
  - ~9,000 in 2017

Among its other scores, UOIT was ranked second overall for both the Active and Collaborative Learning, and Enriching Educational Experience categories, seventh for Student-Faculty Interaction and above the NSSE average in first-year students' evaluations of their entire educational experience and whether they would chose UOIT again if they could start over.



# UOIT Program Areas

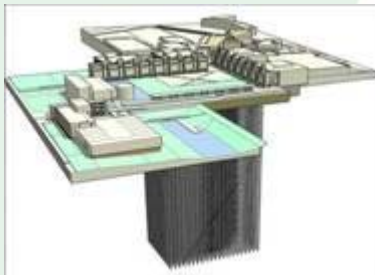
- Engineering
- Applied Science
- Science
- Health Sciences
- Business and IT
- Social Science
- Education

# Why Engineering at UOIT?

## State-of-the-art facilities



**Automotive Centre of Excellence**



**Borehole thermal energy storage**



**Integrated Manufacturing Centre**

## Innovative undergraduate programs

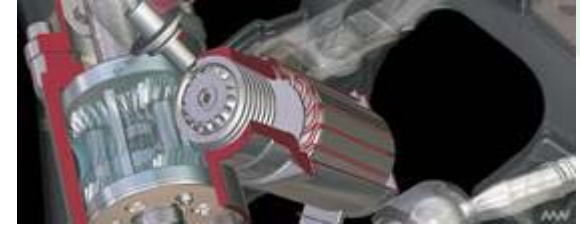
- Automotive Engineering
- Electrical Engineering
- Manufacturing Engineering
- Mechanical Engineering
- Software Engineering
- Engineering and Management (for all programs)

## Graduate programs in high-demand areas

- Mechanical Engineering
- Electrical and Computer Engineering
- Automotive Engineering

## Award-winning faculty

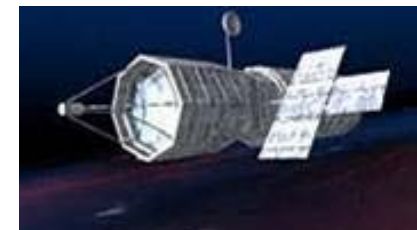
## Value-added research



**Automotive Systems**



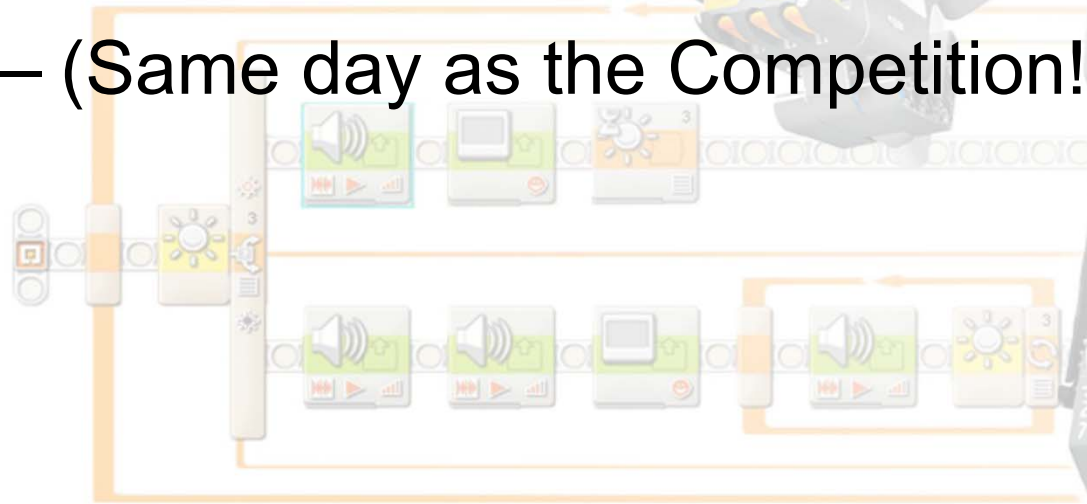
**Robotics and automation**



**Telecommunications**

# UOIT Open House

- November 25<sup>th</sup> from 10:00 – 3:00pm
- (Same day as the Competition!)





# What we Need from You

- Complete payment and registration for each team
  - Next week, please
- Team Member Registrations
  - Online... soon
- Photo release forms
  - These will not be used, media will be present and students need to indicate that they do not want their photos taken on the Registration

# Workshops

- We are planning 2 workshops that will take place here at UOIT.
- Saturday Oct 28 9:00 am -12:00 noon
  - Help and practice on track
- Saturday Nov 11 9:00 am -12:00 noon
  - Trials on track



# The Competition

- Saturday Nov 25<sup>th</sup> 11:30 – 4:30
  - UOIT/DC Main Gymnasium
  - Testing and setup will begin at 9:00 am
- Awards
  - Winner of the challenge
  - Finalists
  - Semifinalists
  - Engineering Award
- T-Shirts for upto 8 students and 1 for the teacher.
  - Make certain that you fill in the form
- SumoBots: King of the Hill



# 2017 UOIT Engineering Robotics Competition

## SumoBots

(this is a summary, the posted  
2017Rules.pdf is the official version)



# Goal

- Each team will design an autonomous Robot that will battle the opposition on a octagonal table in head-to-head competition
- Points for crossing “the hill”
- with no restrictions on movement or prevention of contact between the Robots.
- Eight (8) Robots will compete at the same time.



# Goal, cont

- Each team is required to submit a short technical report documenting their design. This is due Friday November 17<sup>th</sup> by 5:00 pm and is to be submitted electronically.



# SumoBot Tournament Rules

- The referee's word is final on all competition matters including the rules and the results of races.
- Teachers are **NOT** allowed to build, program, or any other way do work on the SumoBot . Teachers are there to be a guide to the students of the team.
- Robots are to act autonomously, i.e., no human control or interference during a match, except as specifically allowed below.
- At the start of a match, each SumoBot must fit into a square 20 cm x 20 cm, with no height limitation. Robots will be measured before the tournament to ensure they comply with this rule. The referee has the discretion to re-measure a SumoBot before any match the SumoBot is participating in. Parts of the Robots may extend outside this area after a match has started.



# SumoBot Tournament Rules

- Races start on the command of the referee.  
Each SumoBot must have a 5 second delay after the operator pushes start before their SumoBot starts to move.
- The SumoBot will be placed in their assigned spot.
- A match is two minutes in length.





# SumoBot Tournament Rules

- Matches will run from the start until one of:
  - Only one sumoBot remains active,
  - 2 minutes have elapsed, or
  - the Referee determines that no further progression will be possible for any SumoBot that has not yet been eliminated
- No SumoBot will be eliminated or removed from the match before the end of the match except by way of its own action or that of its competitors.



# SumoBot Tournament Rules

- SumoBot may not spray any material on the ring or on their opponents, or in any way deform the competition board.
- SumoBot are not allowed to use any flying components or projectiles.
- SumoBot may use various forms of detection to locate the opponents' SumoBot for the purpose of avoiding or attacking those opponents.
- They may also incorporate stealth technology to avoid detection by the opponents' SumoBot .
- Signals may be used to try to confuse the opponents' SumoBot's detectors



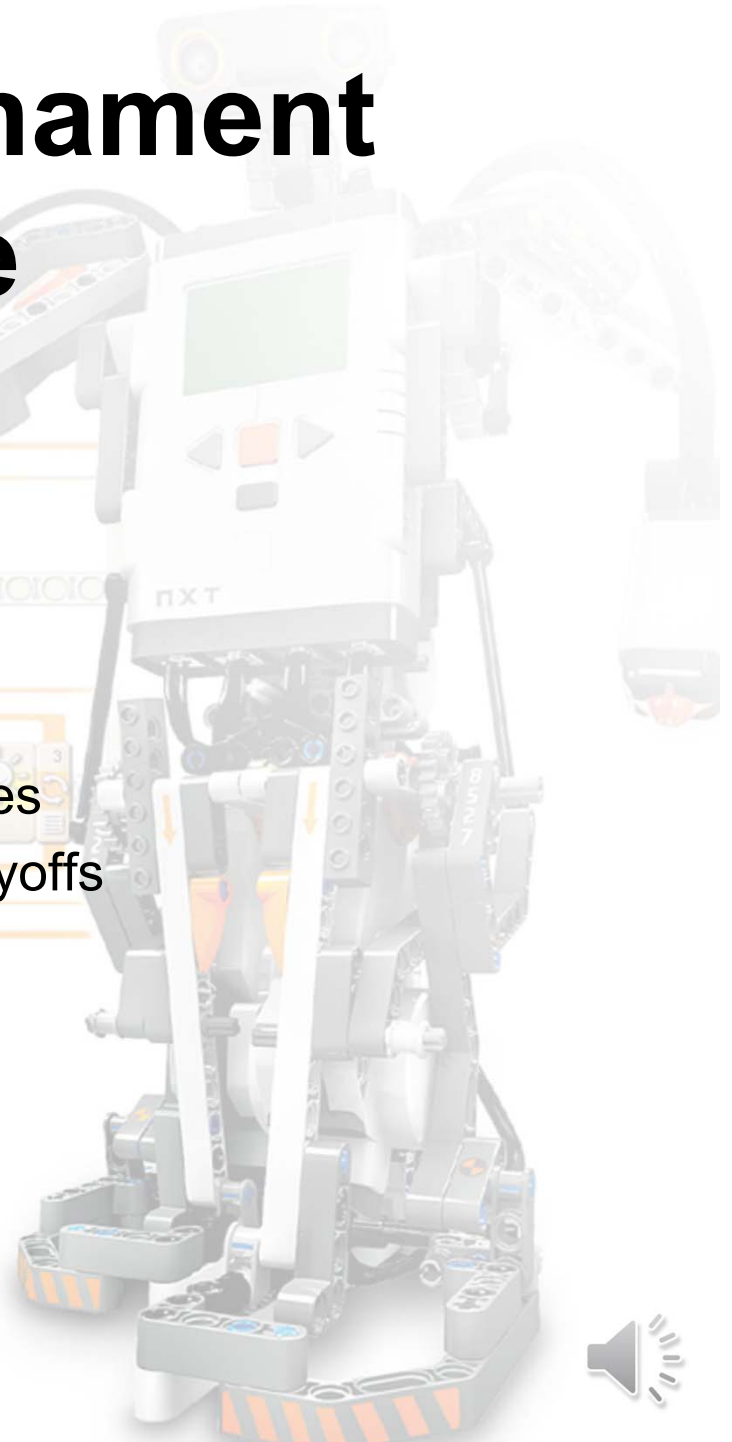
# SumoBot Tournament Rules

- The Bluetooth and WiFi functionality of the NXT/EV3 brick must not be used.
- The SumoBot may be programmed using languages or IDEs other than the Mindstorm NXT/EV3 software.
- Additional Lego parts and sensors **are** allowed, as are and third party sensors, however, they must be detailed in the Engineering Report and the referee will review these part lists prior to the competition. The number of sensors is limited to four, the number of motors is limited to three, and tracks (e.g. instead of wheels) are not permitted.



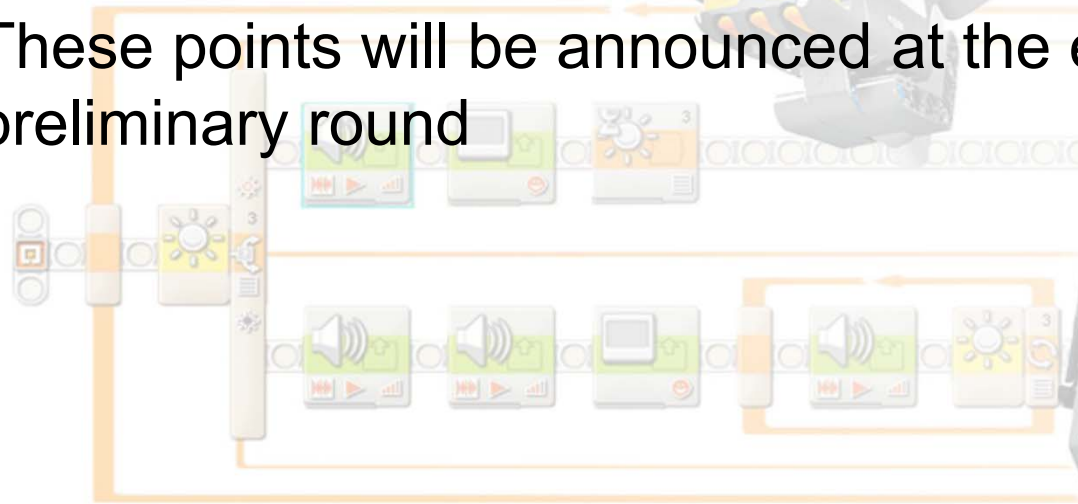
# SumoBot Tournament Structure

- Technical Report
  - Points count towards preliminary round
  - Points used for tiebreakers
  - Points used for lane choice in finals
- Preliminary round
  - Each team has same number of matches
  - Top 16 (or more) teams advance to playoffs
- Playoff round
  - Quarter-final round (if time permits)
  - Semi-final round
  - Final round



# SumoBot Tournament Structure

- Technical Report will be receive up to 12 points.
- These points will be announced at the end of the preliminary round



# SumoBot Tournament Structure

- For each race, points will be awarded as follows for the Robot that cross the Finish Line in order or who have progressed furthest towards the Finish Line at the end of the race:
  - First (last one surviving) 12 points
  - Second 9 points
  - Third 6 points
  - Fourth 5 points
  - Fifth 4 point
  - Sixth 3 points
  - Seventh 2 points
  - Eighth (first one eliminated) 1 points
- Upto three points for repeatedly crossing “the hill” (1 pt first crossing, ½ pt subsequent crossings)
- Upto two points for disabling an opponent



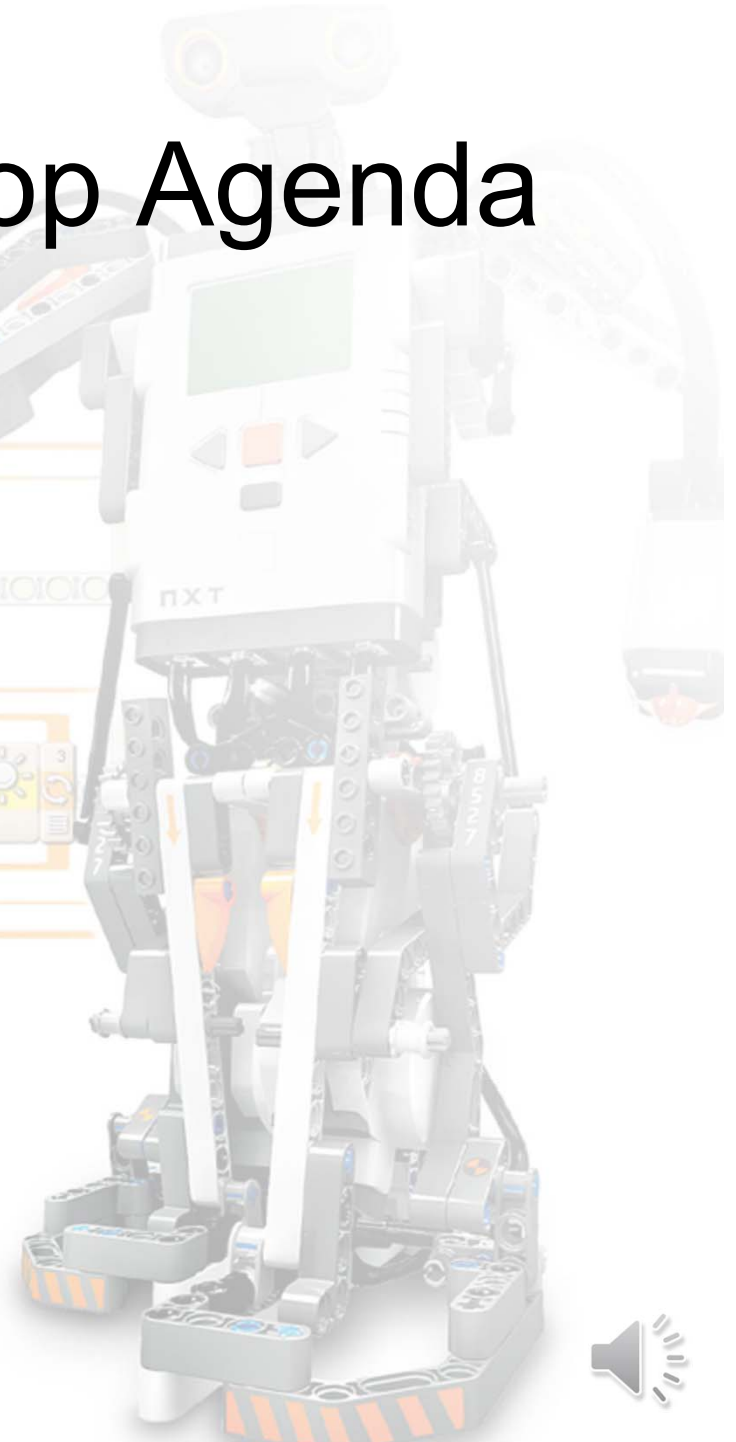
# SumoBotTournament Structure

- Tiebreakers to advance from the preliminary round:
  - 1<sup>st</sup>: Technical Report score
  - 2<sup>nd</sup>: Head-to-head score in any rounds where they met
  - 3<sup>rd</sup>: A tie-breaking race
- Tie-breakers to advance in the final rounds
  - 1<sup>st</sup>: Technical Report score
  - 2<sup>nd</sup>: A tie-breaking race



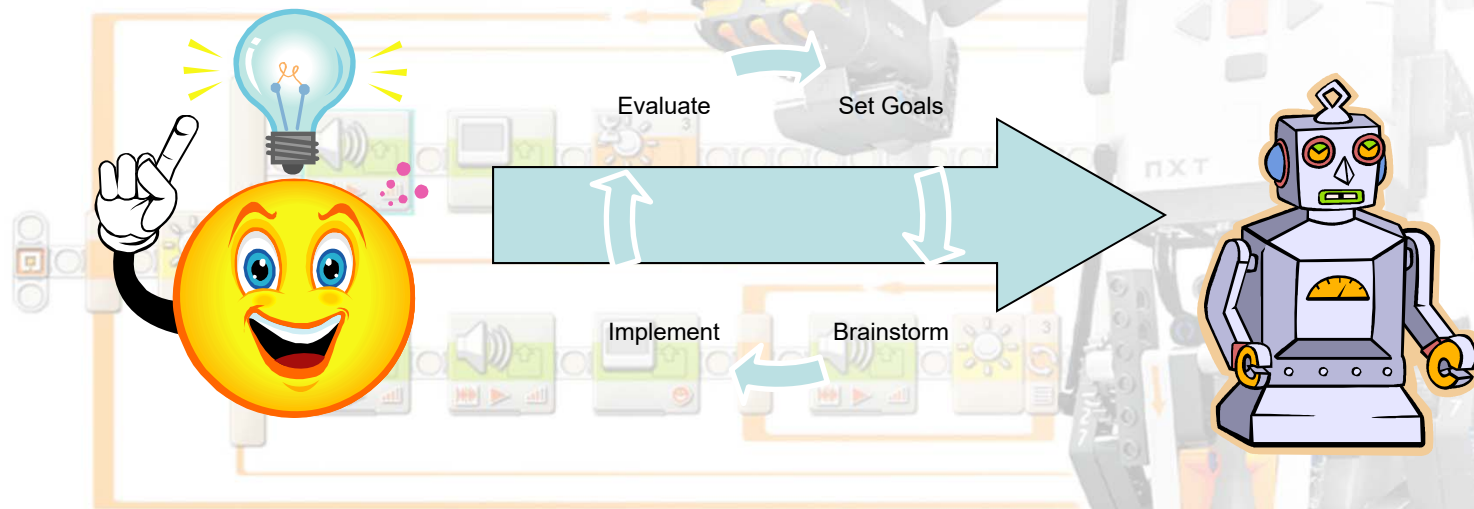
# Beginner's Workshop Agenda

- Design Process
- Beginners' Workshop
- Project Timeline
- Resources
- Questions





# Design Process



Start with the end in mind.

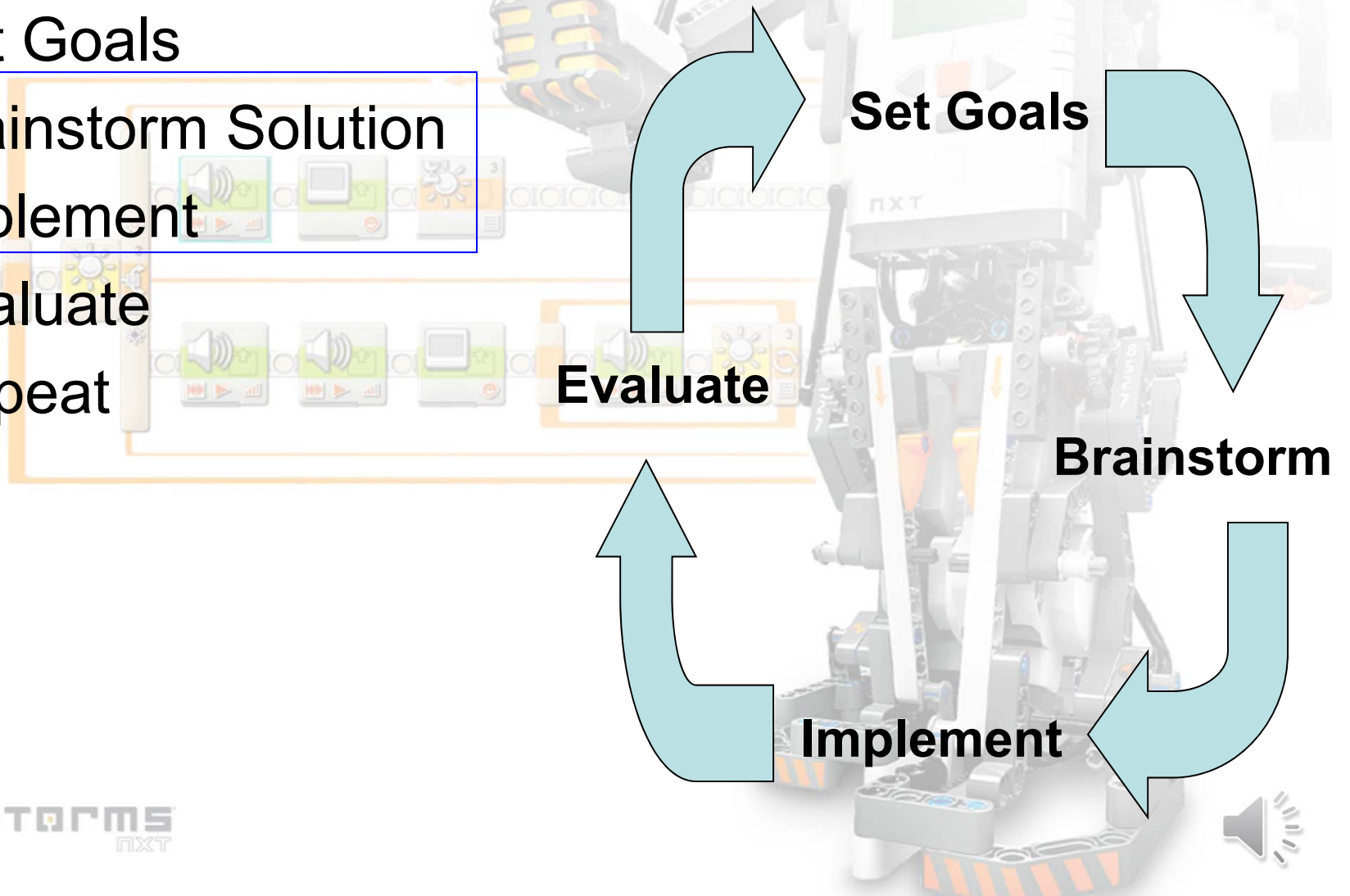
Identify what you want the robot to do.

The design process determines how it will do it.”



# Design Cycle

- Set Goals
- Brainstorm Solution
- Implement
- Evaluate
- Repeat



# Brainstorm

- As many ideas as possible
  - Sketches
  - Pictures
- Individual, Paired, Group
- Criteria = important features
- Concept selection



Think “No way”, Say “Good idea”



# Implementation Tips

- Bite-size chunks
- Test often
  - Take time to save time!



# Design Process Key Points

“Brainstorm ideas before starting to build.”

“Test often to save time.”



# Tutorial – EV3 system setup

- <http://www.lego.com/en-us/mindstorms/downloads/download-software>
  - Google: lego ev3 software
- Install
- Check Firmware version (not necessary)



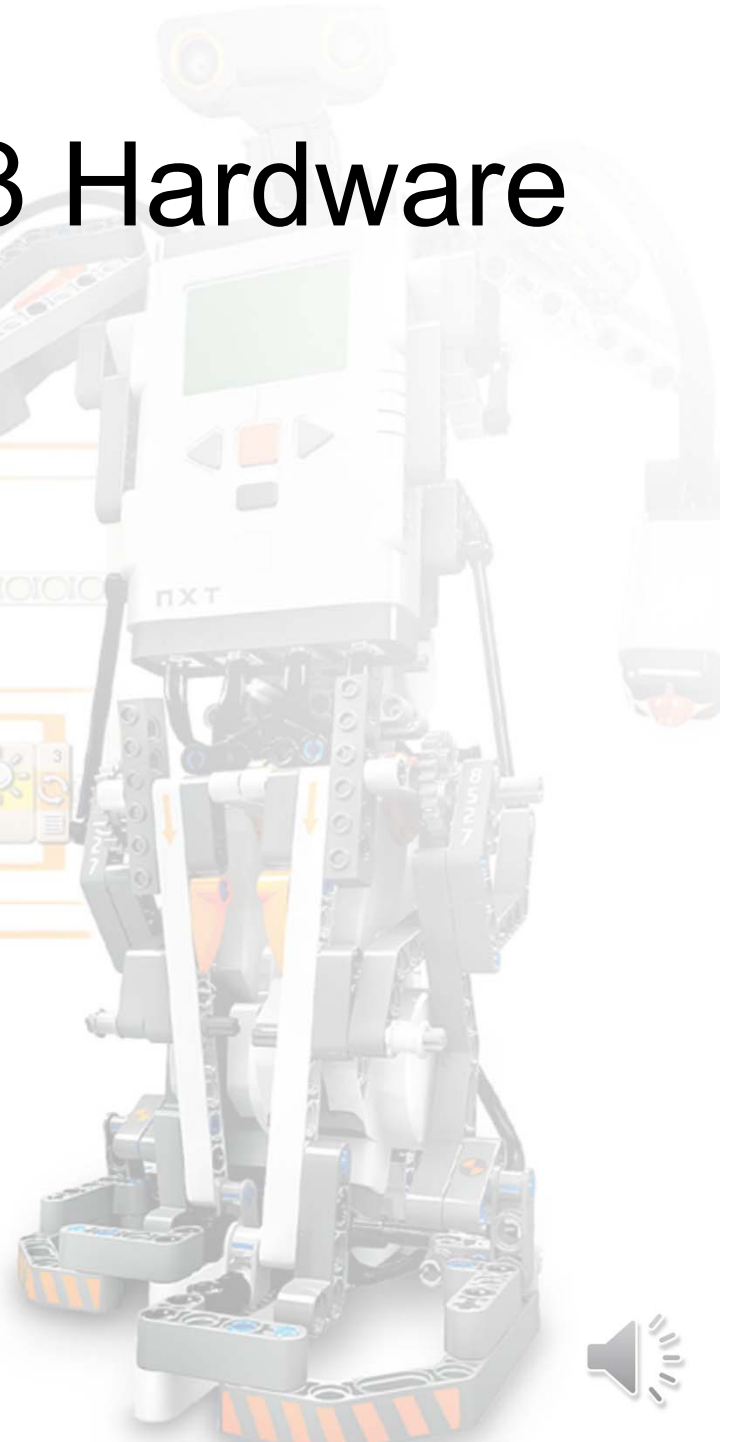
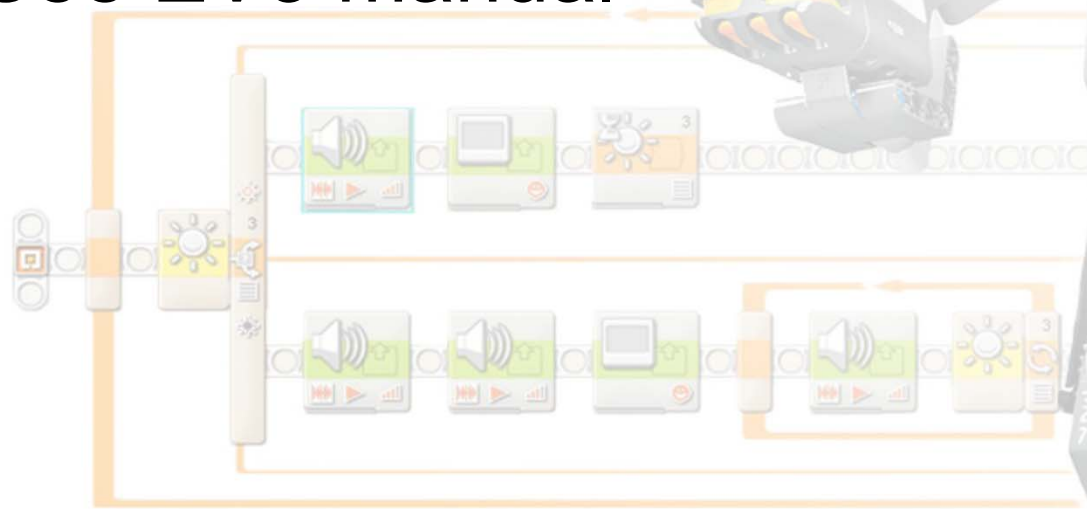
# Tutorial Part 1 – EV3 system

- <http://www.lego.com/en-us/mindstorms/learn-to-program>
  - Google: lego ev3 learn to program
- Programming environment
- Hello World
- Motor control
- Sensor
- Making it move



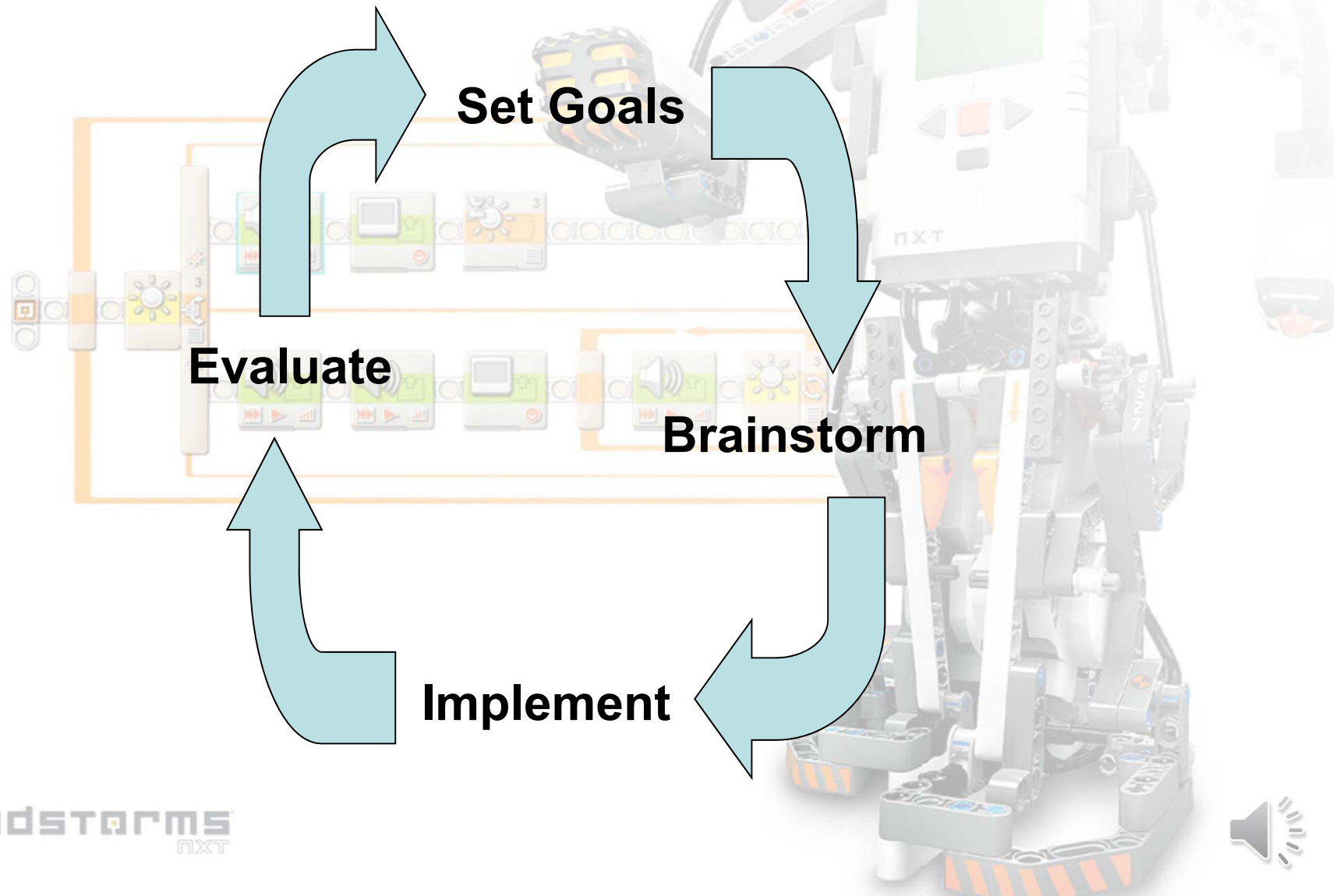
# Tutorial part 2 – EV3 Hardware

- See EV3 manual





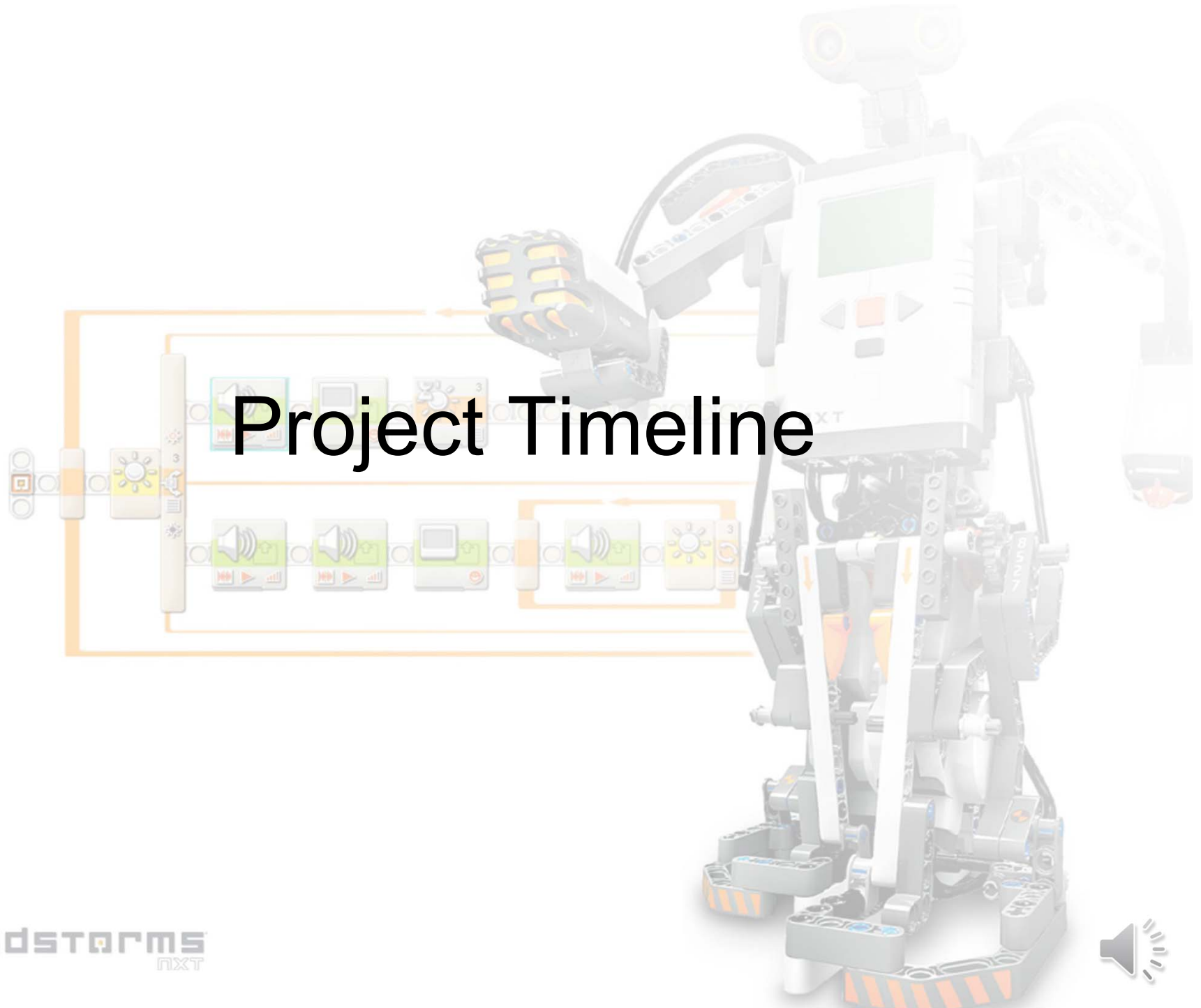
# Tutorial Part 3 - Design



# Next Workshop

- October 28, 9 am to noon
  - Design/programming help
  - Testing on the Octagon
  - Head-to-head practice Opportunity
  - Questions & Answers





# Project Timeline



# Sample Timeline

**Week 1: Set goals / Brainstorm solutions / Familiarize**

**Week 2: Bite-sized chunks (Plan implementation)**

**Week 3: Build / Test**

**Week 4: Evaluate / Changes**

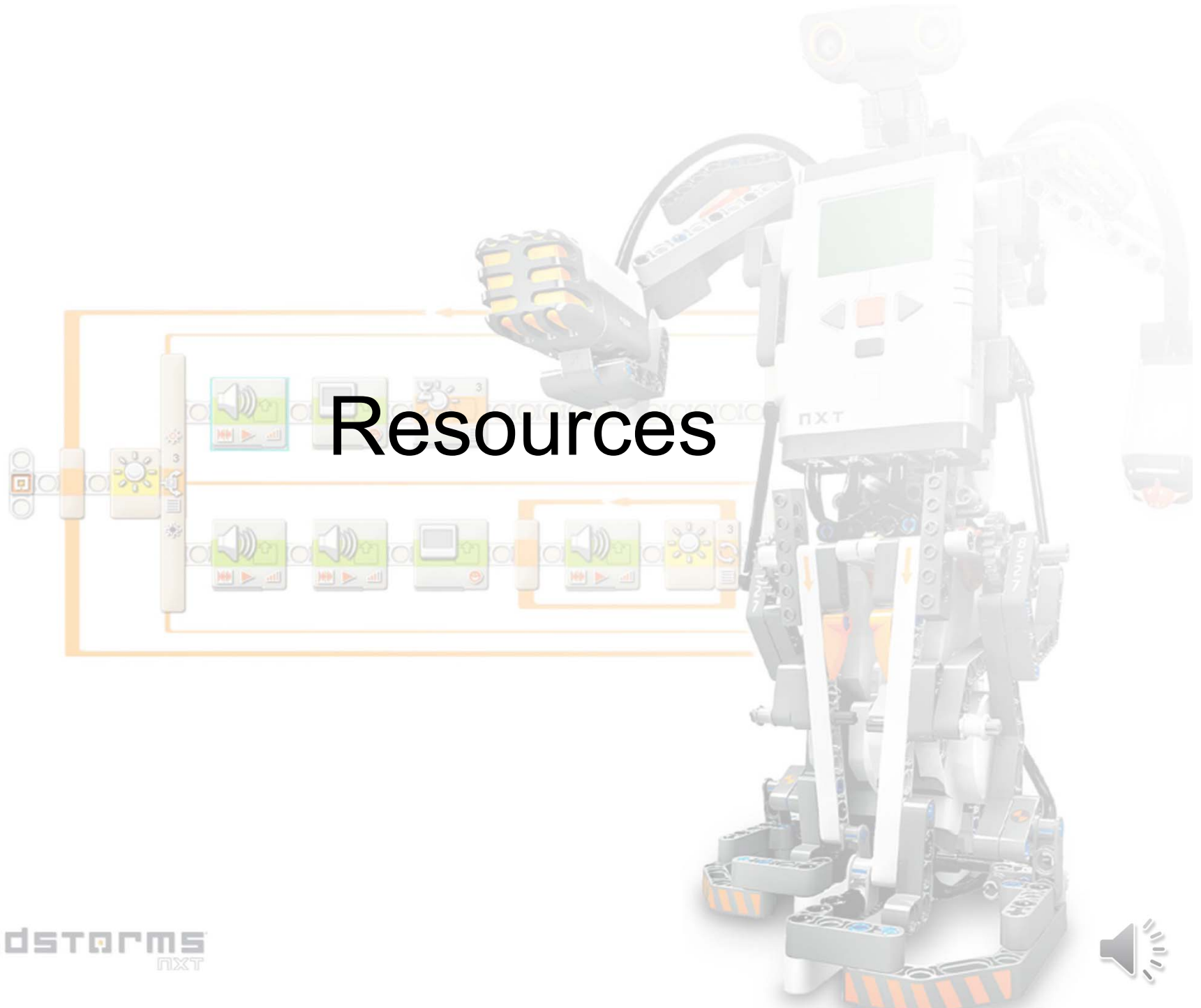
**Week 5: Finishing Touches**



# Timeline – Take home message

“Look ahead.”





# Resources



# Resources

- 5 learning resources
- Posted on competition website
  - <http://roboticscomp.engineering.uoit.ca/>
  - Google **UOIT robotics**



# Fantastic Resources

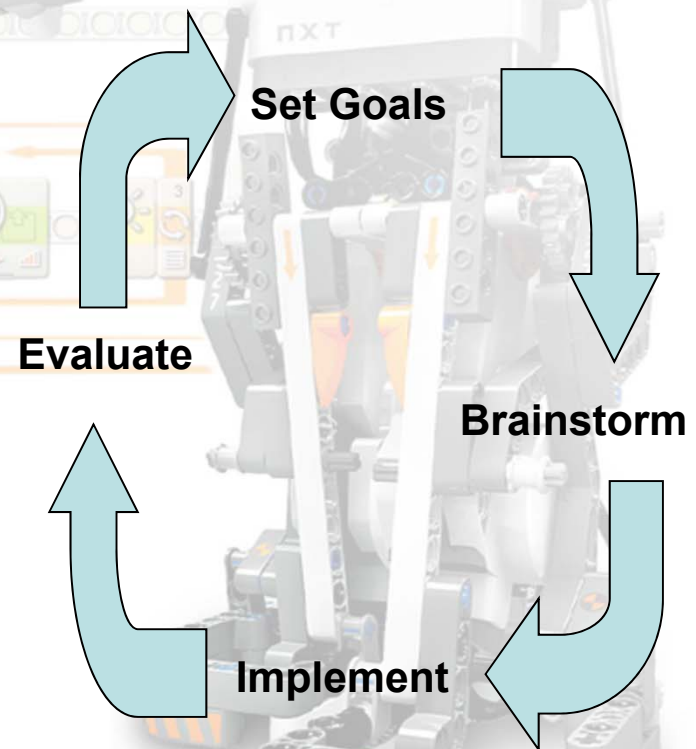
1. Booklet
2. *Robot Educator* in LEGO MINDSTORMS Edu NXT
3. More Lego Tutorials
  - <http://www.legoengineering.com> → Learning Lab → Learning Sequences
4. Software Tutorials
  - [http://www.ortop.org/NXT\\_Tutorial/](http://www.ortop.org/NXT_Tutorial/)





# Summary

- Design Process
  - “Brainstorm ideas before starting to build.”
  - “Test often to save time”
- Workshops
  - October 29
  - November 12
- Project Timeline
  - “Look ahead.”
- Resources



# Questions?

