

5.– 8. September 2011
in Nürnberg



Herbstcampus

Wissenstransfer
par excellence

Playing like a nerd

Lego Roboter mit iPad steuern

Tim de Buhr

open
knowledge GmbH

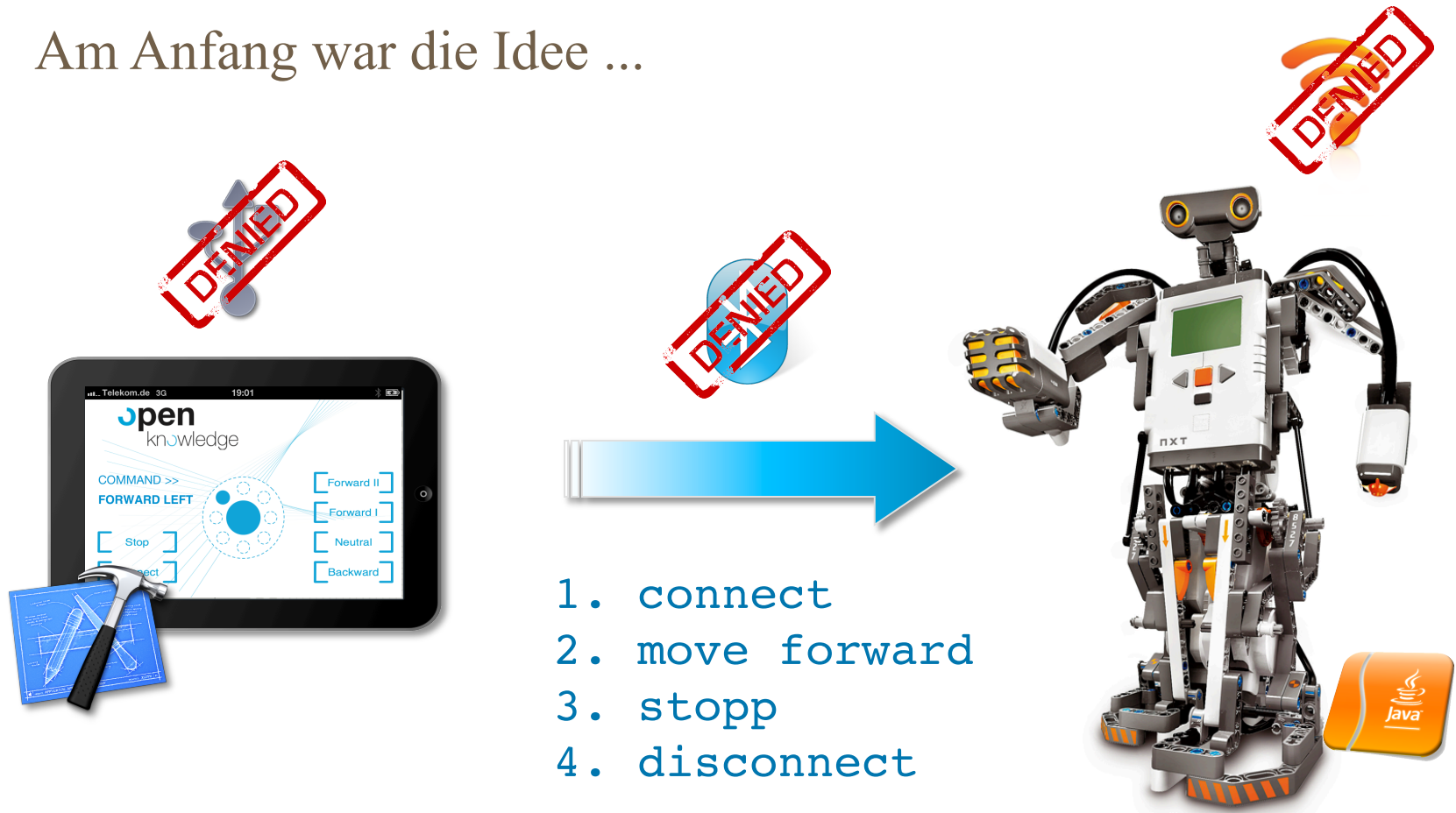
ffenkundiggut

The Nerd Session



The Nerd Session

Am Anfang war die Idee ...



„Walk of fame/pain“

Mac OS

Bluetooth

Lejos NXJ

Lego NXT 2.0

wth Apple?

wth BT?

USB

Friends!

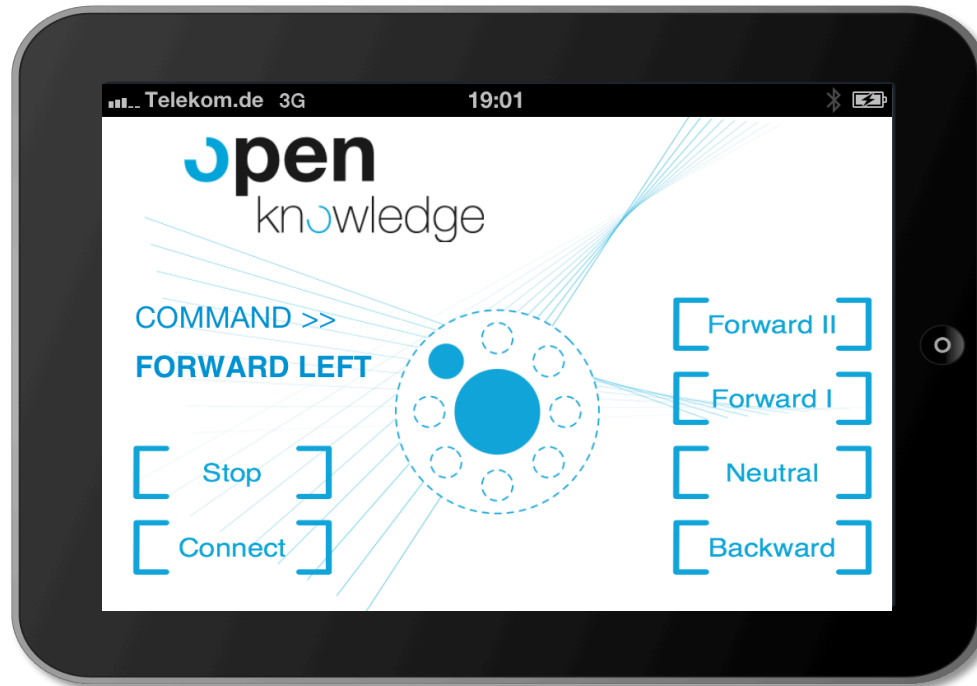
tinyVM

wth USB?

Sensors

Eclipse

wth OS X?



Software NXT-G

Accelerometer

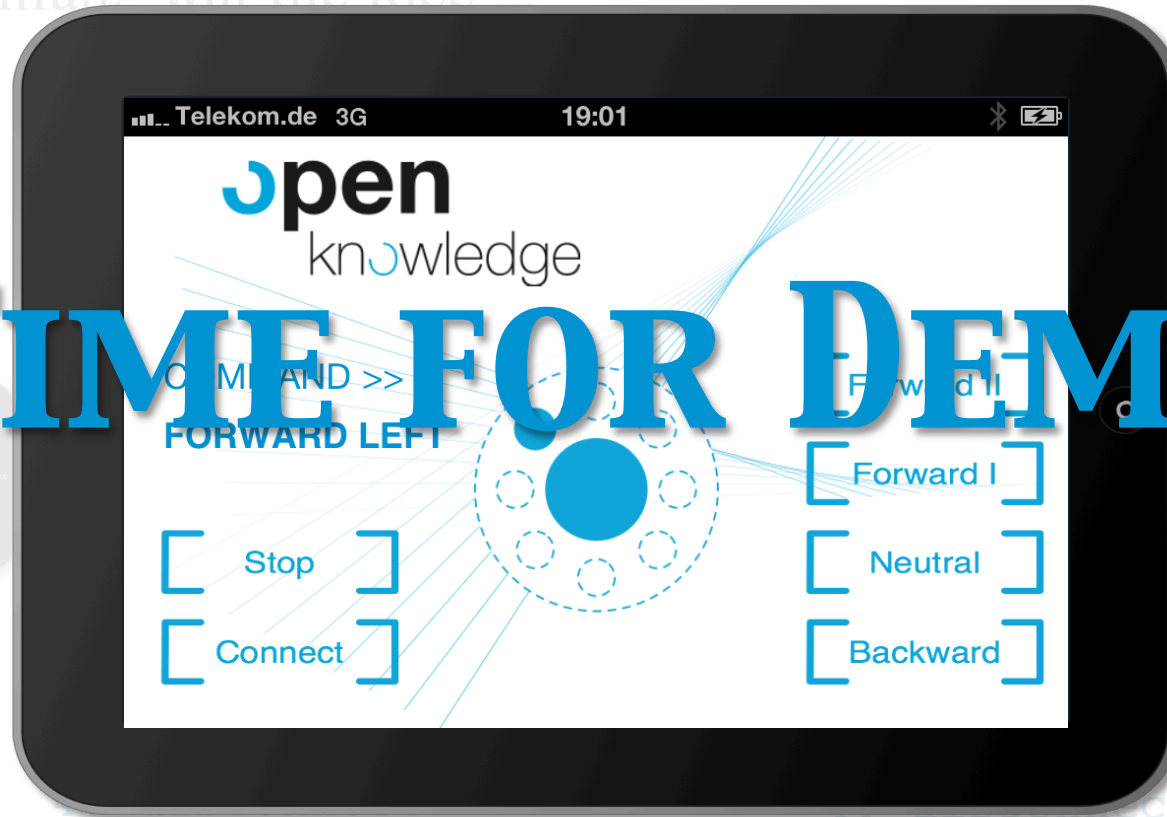
Motors

ad hoc APP

The Nerd Session

Am Anfang war die Idee

TIME FOR DEMO



The Nerd Session

Agenda

- Kind, warum machst du das?
- Lego Mindstorm
- Lego Mindstorm & Java
- Lego Mindstorm & Java & iPad

The Nerd Session

Lego Mindstorm

*„We will do for Robotics
what iPod did for Music“*

S. Lund,

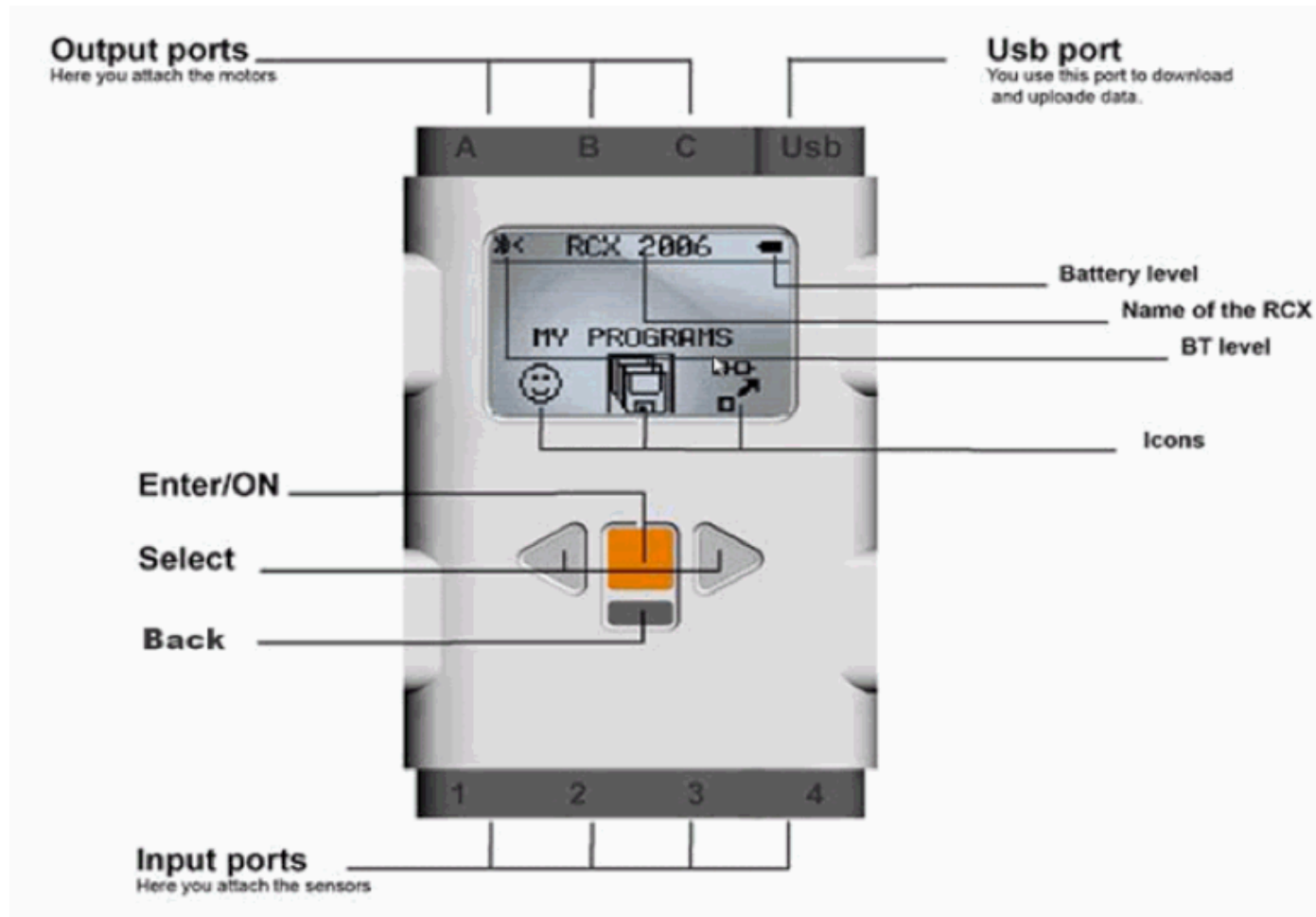


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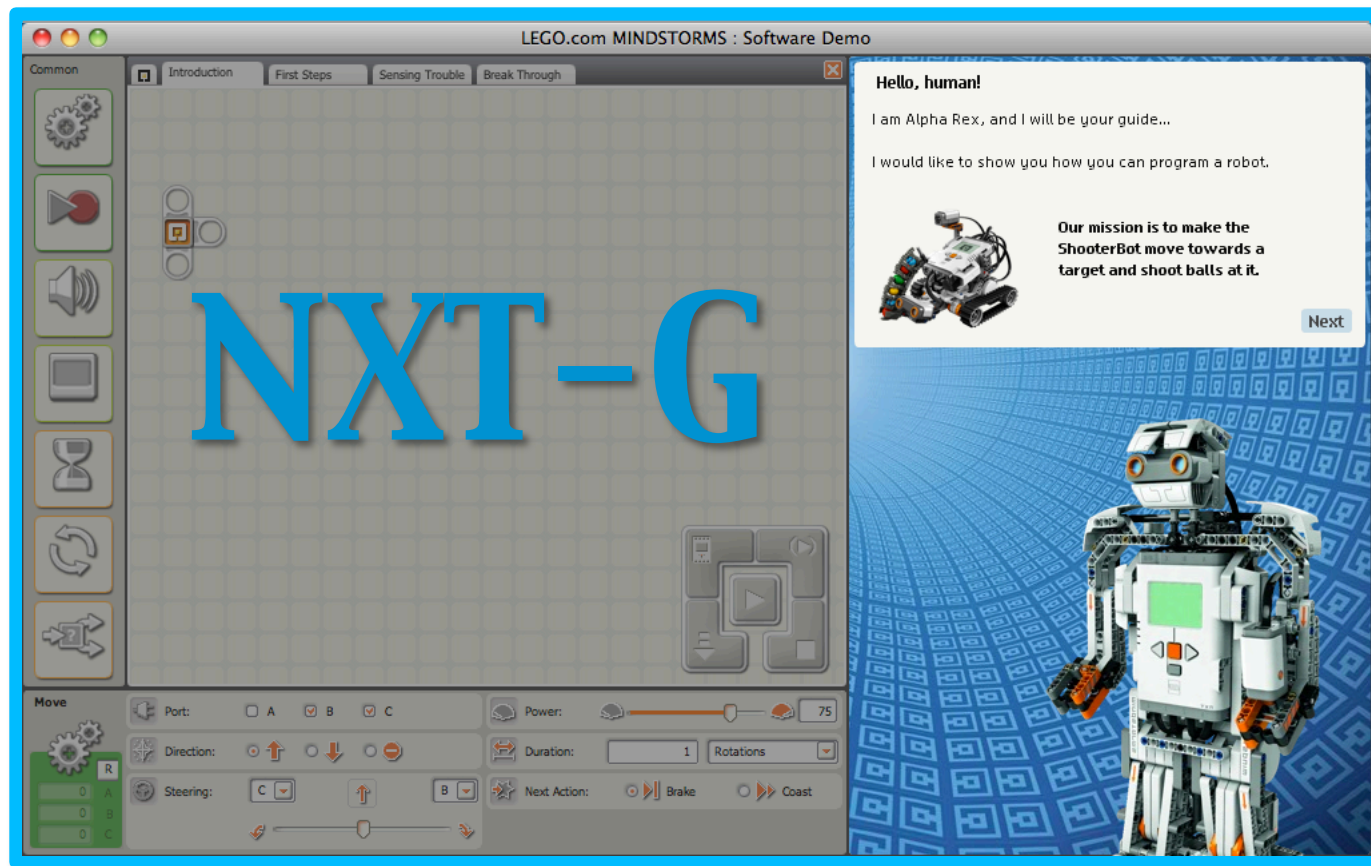
Lego Mindstorm



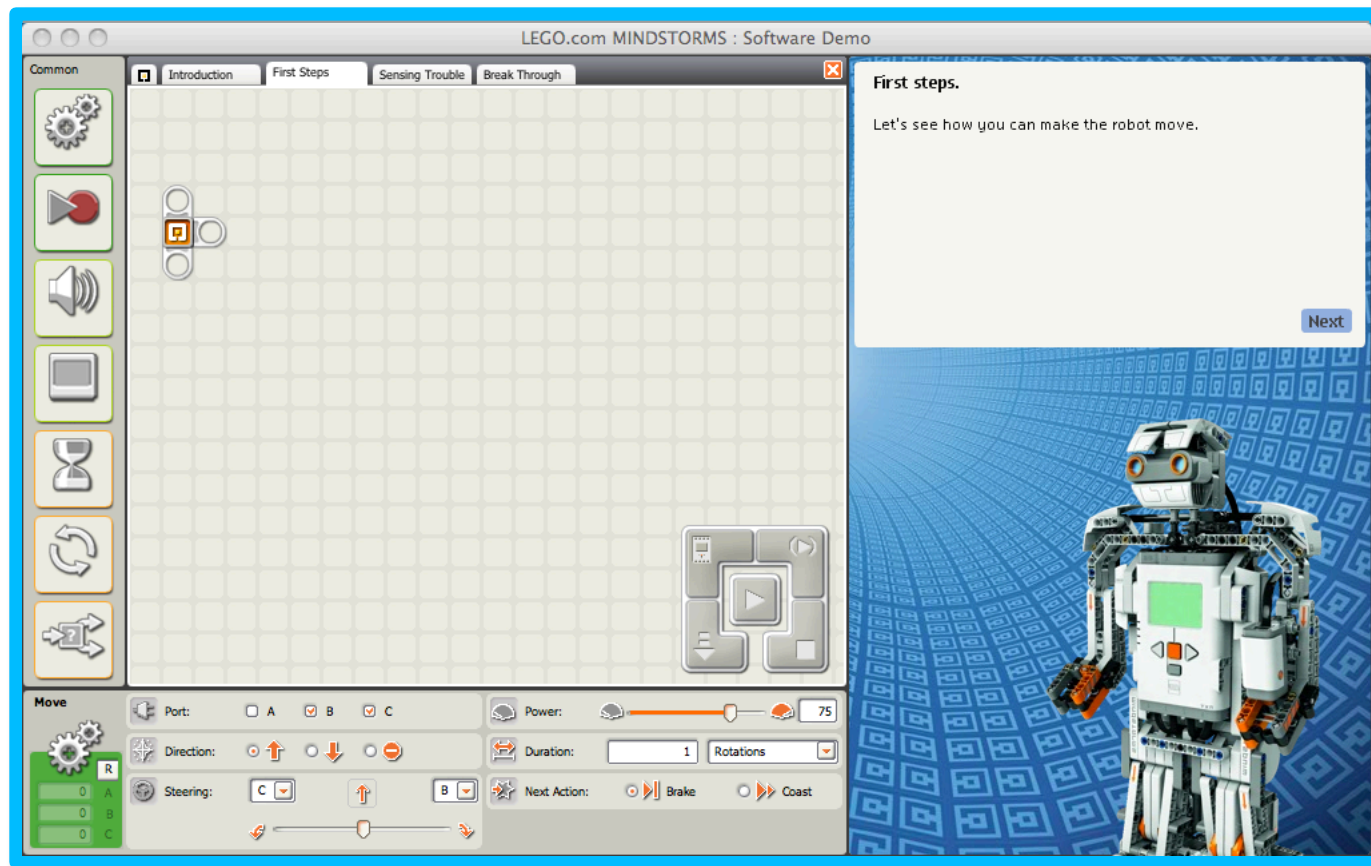
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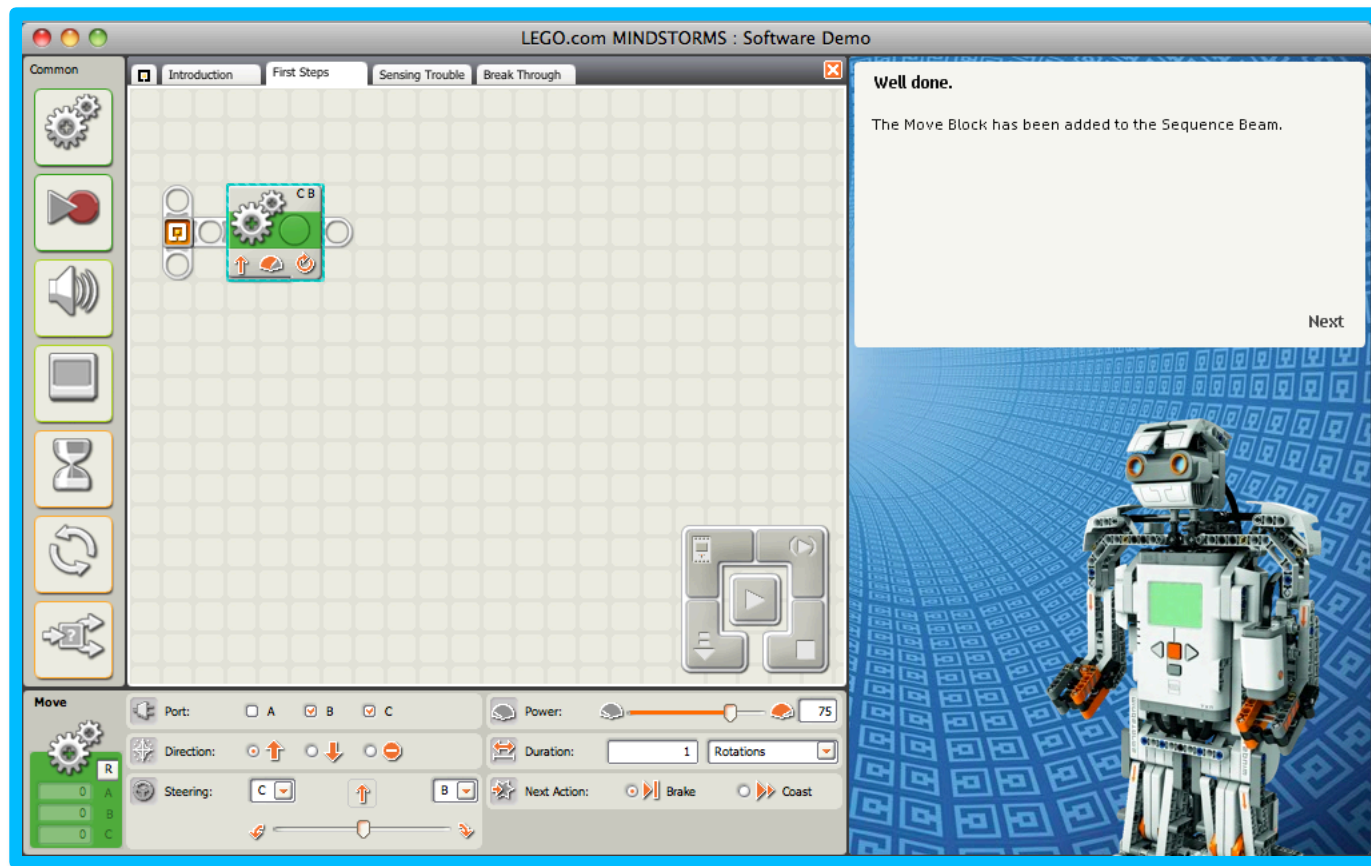
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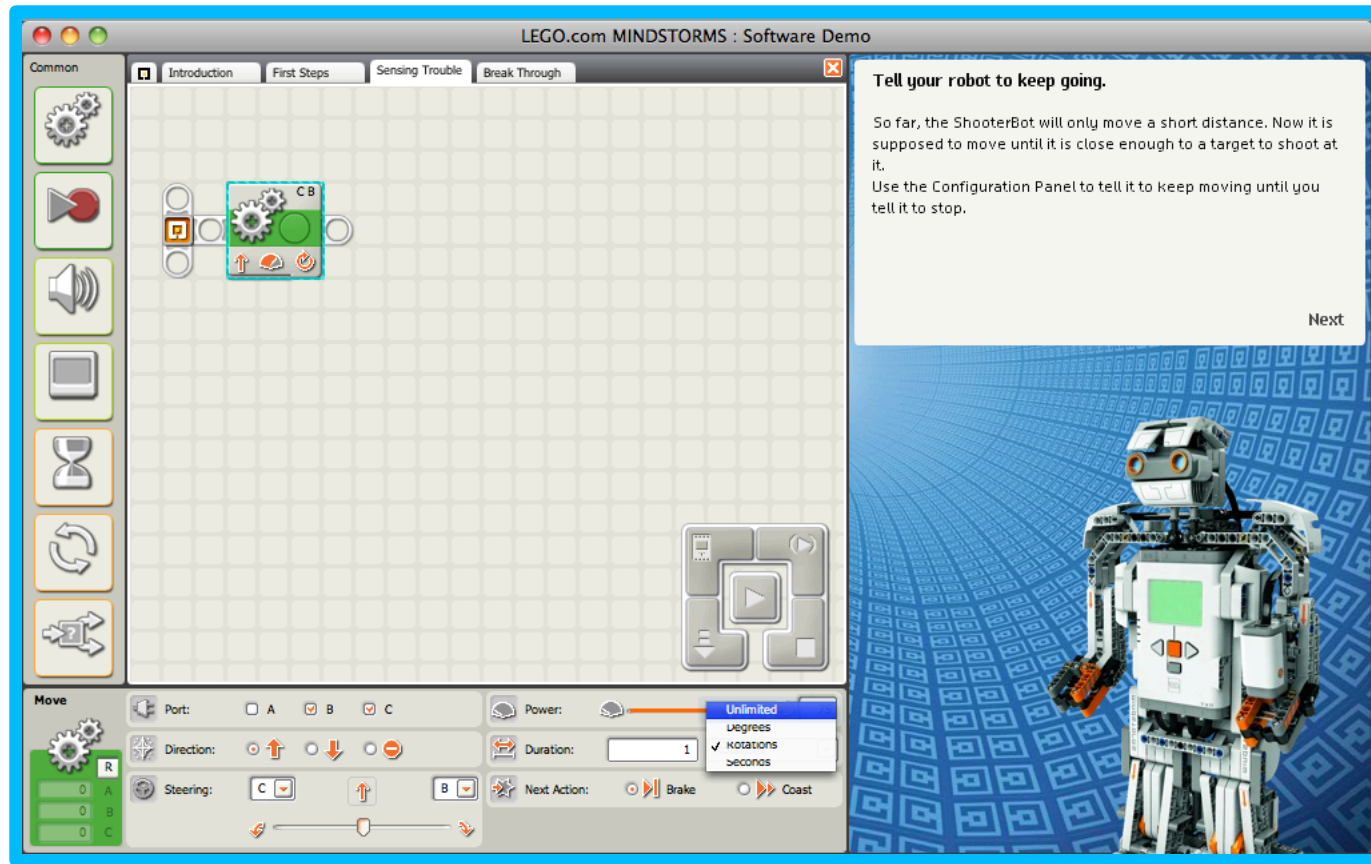
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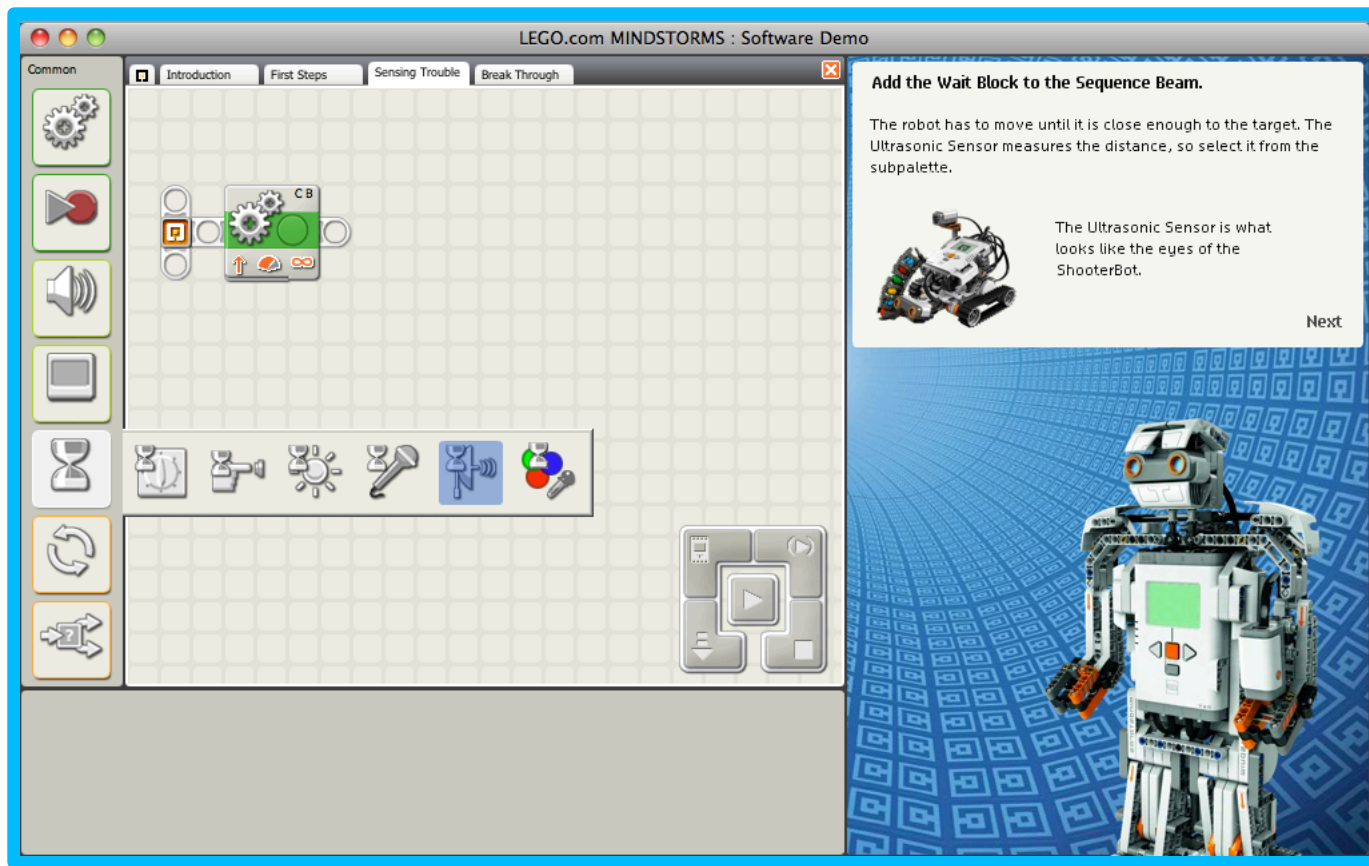
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The Nerd Session



The Nerd Session



The Nerd Session

LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

We are almost there...

We still have to tell the robot how close it should move to the target. The Configuration Panel lets you set the distance you want to wait for.

The ShooterBot can shoot a ball quite far, but now it is supposed to wait until it is very close. Click on the highlighted area in the panel to set the distance.

Next

Wait

Control: Sensor Port: 1 2 3 4

Sensor: Ultrasonic Sensor

Until: Distance: 50

Show: 1 inch Inches

The Nerd Session

LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

Stop! The robot is now close enough.

Earlier, you told the robot to keep moving until you tell it to stop. Now it is close enough to the target. You need another Move Block for that, so select it from the Common Palette.

Next

Wait

Control: Sensor Port: 1 2 3 4

Sensor: Ultrasonic Sensor

Until: Distance: 12

Show: Inchi Inches

The Nerd Session

The screenshot shows the LEGO.com MINDSTORMS software interface. The main workspace contains a sequence of three blocks: a 'Move' block, a 'Wait' block (labeled '4'), and another 'Move' block. The second 'Move' block is highlighted with a blue border. A feedback message box on the right says 'Very good.' and provides instructions: 'You can use the highlighted area of the Move Block's Configuration Panel to tell the robot to move forwards, backwards or stop. That is what you have to do next, so click it to make the ShooterBot stop in front of the target.' Below the message is a 'Next' button and an image of a LEGO Mindstorms robot.

LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

Very good.

You can use the highlighted area of the Move Block's Configuration Panel to tell the robot to move forwards, backwards or stop. That is what you have to do next, so click it to make the ShooterBot stop in front of the target.

Next

Move

Port: A B C Power: 75

Direction: ↑ ↓ ↻

Duration: 1 Rotations

Steering: C ↑ B ↓

Next Action: Brake Coast

The Nerd Session

LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

Let's shoot at the target.

At this point, the ShooterBot is standing right in front of the target. You need another Move Block to trigger the ball to be shot, so select it from the Common Palette.

Next

Move

Port: A B C Power: 75

Direction: ↑ ↓ ← →

Steering: B C

Duration: 1 Rotations

Next Action: Brake Coast

The Nerd Session

The screenshot shows the LEGO.com MINDSTORMS software interface. The main workspace contains a sequence of four blocks: a 'Move' block with a highlighted 'C' port, a 'Wait' block for 4 seconds, another 'Move' block with a highlighted 'C' port, and a final 'Move' block with a highlighted 'C' port. The 'Move' block configuration panel at the bottom shows 'Port: C', 'Direction: Forward', 'Duration: 1 Rotations', and 'Next Action: Brake'. A 'Common' panel on the right contains a text box with the following text:

Move Blocks can control any motor.

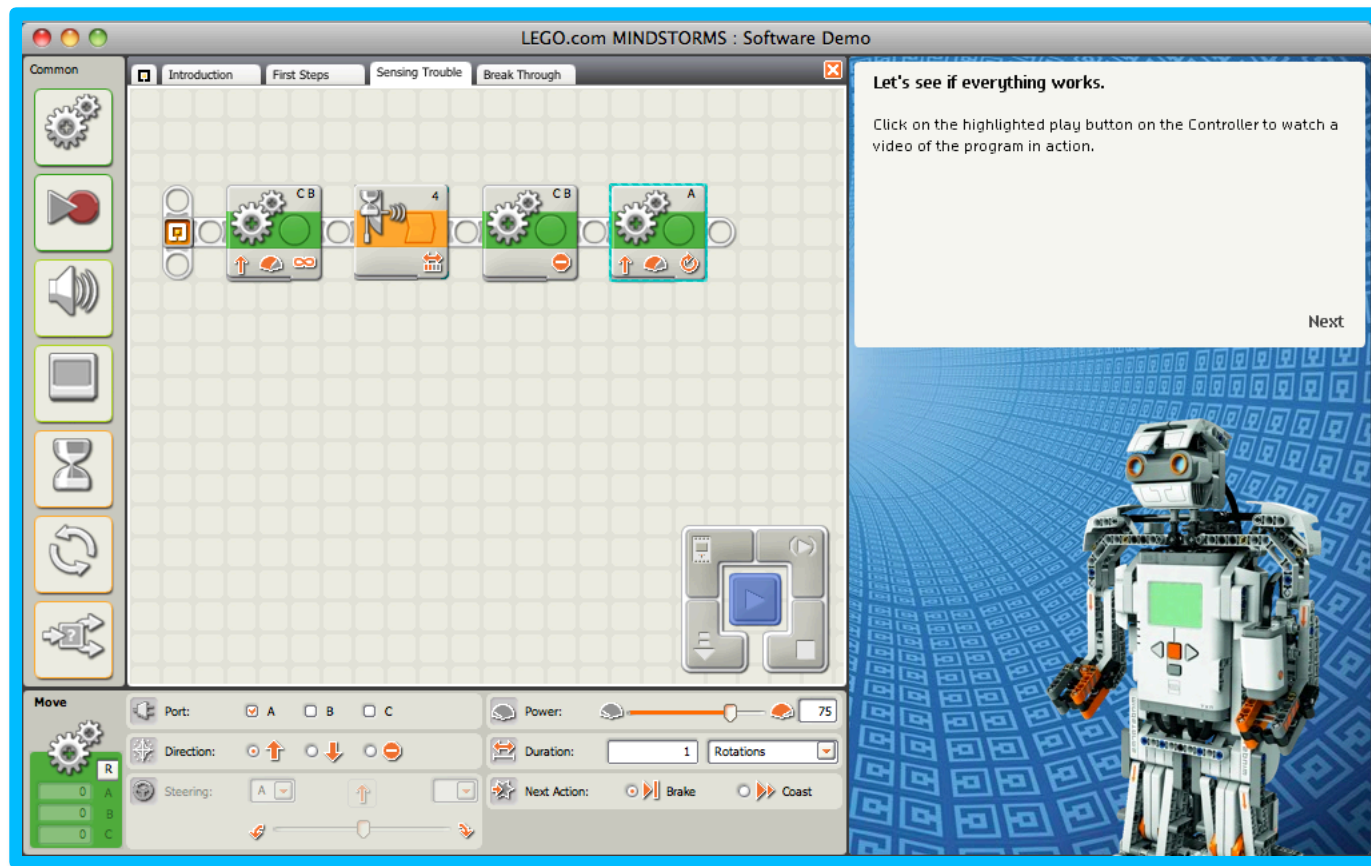
Right now you are controlling the two motors that make the robot drive – now you can program the last motor (A) to move, so the robot starts shooting.

Click on the highlighted area in the Configuration Panel to have it control the shooting motor.

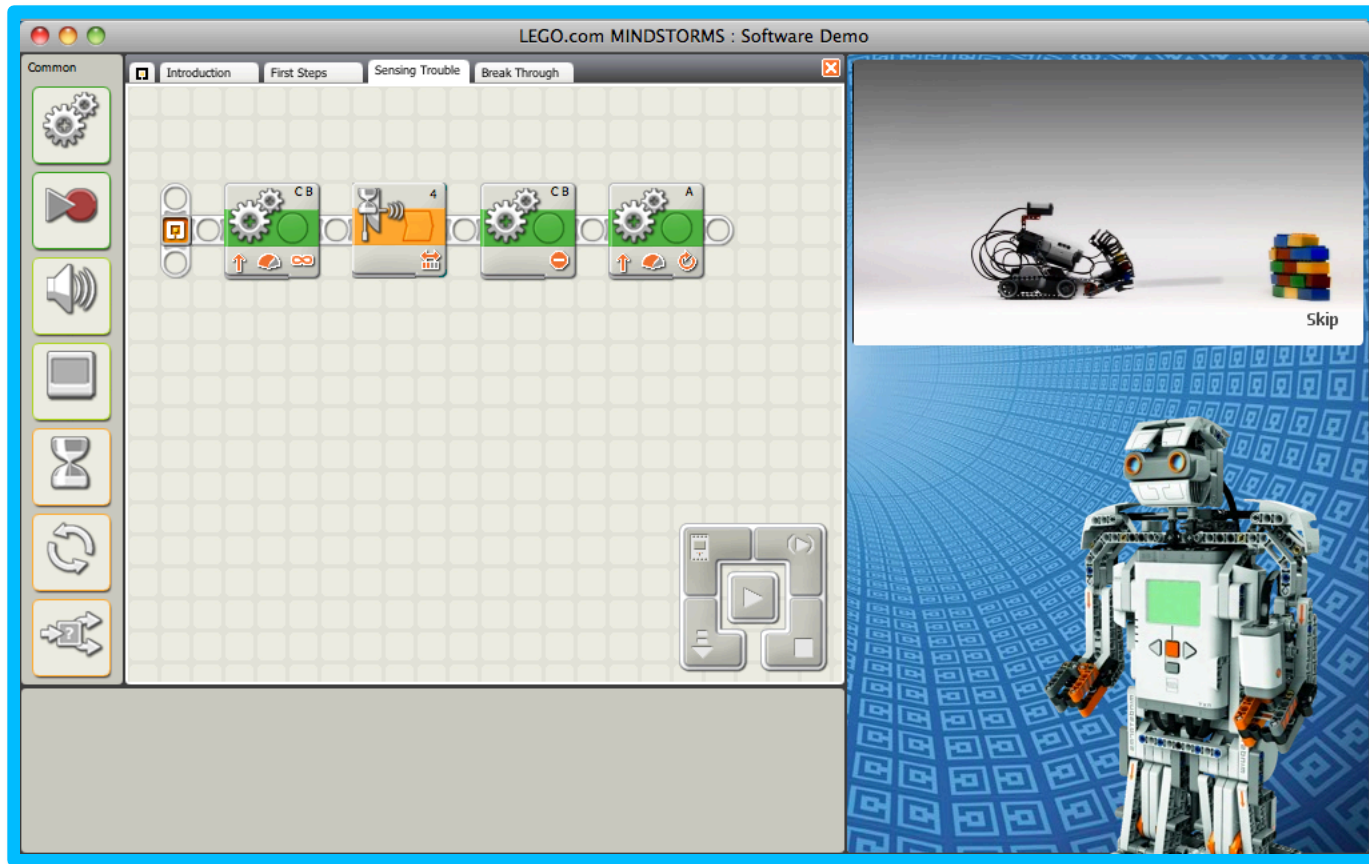
Next

The background of the right panel features a blue grid pattern and a LEGO Mindstorms robot.

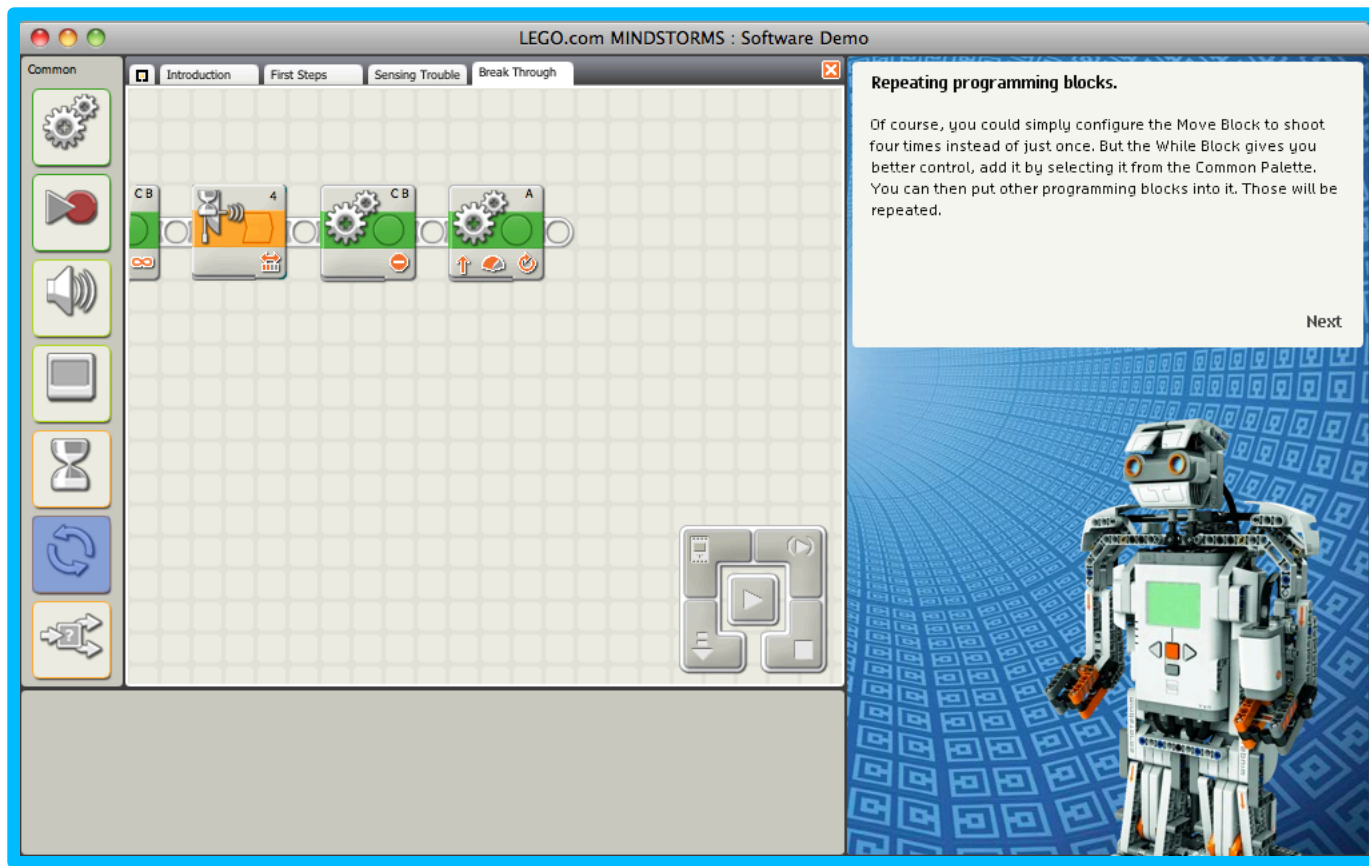
The Nerd Session



The Nerd Session



The Nerd Session



The Nerd Session

The screenshot shows the LEGO.com MINDSTORMS software demo interface. The main workspace displays a sequence of programming blocks: a 'C B' block, a '4' block, a 'C B' block, an 'A' block, and a 'While Block'. The 'While Block' is currently set to 'Forever' (indicated by an infinity symbol). A configuration panel on the right is titled 'Configure the While Block.' and contains the following text:

Configure the While Block.

To repeat programming blocks a specified number of times, set the 'While Block' to 'count'. Select that option from the menu in the Configuration Panel.

Next

The 'Loop' panel at the bottom left shows a dropdown menu with the following options: 'Forever' (checked), 'sensor', 'Time', 'Count', and 'Logic'. The 'Show:' section has a checkbox for 'Counter' which is currently unchecked.

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LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

Configure the While Block.

To repeat programming blocks a specified number of times, set the While Block to 'count'. Select that option from the menu in the Configuration Panel.

Next

Control:

- ✓ Forever
- sensor
- Time
- Count
- Logic

Show: Counter

The Nerd Session

The screenshot displays the LEGO.com MINDSTORMS software interface. The main workspace shows a sequence of programming blocks: a 'C B' block, a '4' block, another 'C B' block, an 'A' block, and a 'White Block' (highlighted in orange). The 'Loop' panel at the bottom is active, showing 'Control: Count' and 'Count: 1'. A 'Show: Counter' checkbox is also visible.

A tutorial window titled 'Configure the White Block.' is open on the right. It contains the following text:

Configure the White Block.

To shoot four balls, the counter needs to be set to four. Click on the highlighted area again to adjust this setting.

Next

The background of the tutorial window features a blue grid pattern and a LEGO Mindstorms robot.

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LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

Configuring the Sound Block.

Before every shot, the ShooterBot should play a short beep. Click on the highlighted area in the Configuration Panel to play a tone instead of a sound file.

Next

Sound

Action: Sound File Tone

Control: Play Stop

Volume: 75

Function: Repeat

Wait: Wait for Completion

File: Good Job, Good, Goodbye, Goodmorning, Green

The Nerd Session

LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

Adding the Move Block to the While loop.

The way it is now, the program is telling the robot to move close to the target, stop, shoot once and then beep four times. But didn't we want to shoot four balls at the target?

The last step is to drag the Move Block into the While loop, right behind the Sound Block. Simply click on it to move it where it belongs.

Next

Sound

Action: Sound File Tone

Control: Play Stop

Volume: 75

Function: Repeat

Note: A for: 0,5 seconds

Wait: Wait for Completion

The Nerd Session

LEGO.com MINDSTORMS : Software Demo

Common

Introduction First Steps Sensing Trouble Break Through

Let's try it!

Click the play button on the Controller to see if the ShooterBot can finally break that wall down.

Next

Move

Port: A B C

Direction: Up Down Left Right

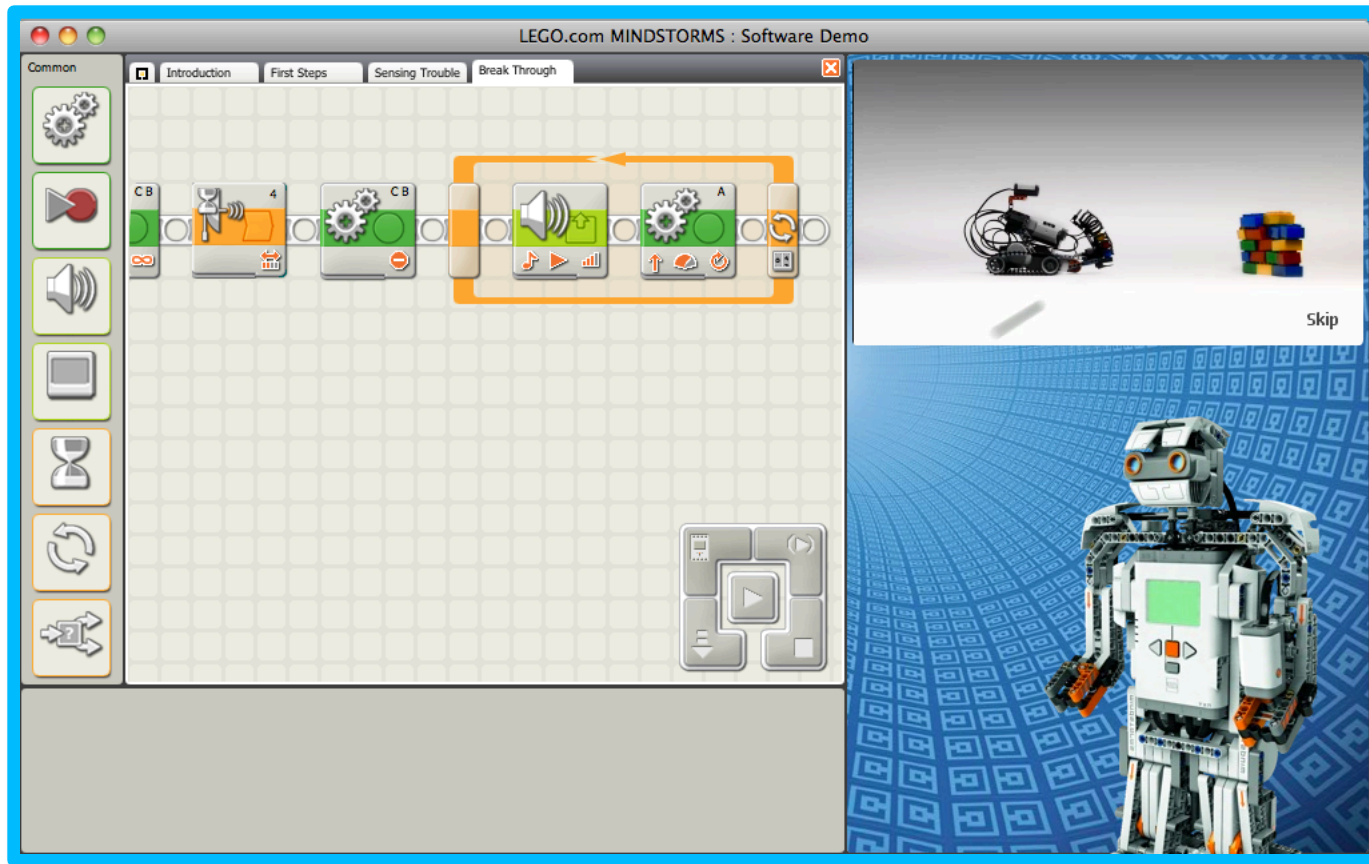
Steering: A B C

Power: 75

Duration: 1 Rotations

Next Action: Brake Coast

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The Nerd Session

Lego Mindstorm & Java



The Nerd Session

Lego Mindstorm & Java



The Nerd Session



- leJOS NXJ Kickstart
 - LEJOS_HOME und .../bin setzen
 - Firmware auf Brick laden
- leJOS Programm schreiben
 - lejoscc MyProgram.java (compile)
 - lejosdl MyProgram.lej (upload)

*supported by
Eclipse Plug-In*





Code Diving ...

The Nerd Session



Robotic Classes

Battery Power

Motoren

Buttons

Sound

Sensoren

LCD Display

System Time

Bluetooth

The Nerd Session



Robotic Classes

Battery Power

Motoren

Buttons

Sound

Sensoren

LCD Display

System Time

Bluetooth

The Nerd Session



LightSensor

SoundSensor

UltraSonicSensor

CompassSensor

(Sensoren)

TouchSensor

ColorSensor

TiltSensor

The Nerd Session



Robotic Classes

Battery Power

Motoren

Buttons

Sound

Sensoren

LCD Display

System Time

Bluetooth

The Nerd Session



Robotic Classes

Battery Power

Motoren

Buttons

Sound

Sensoren

LCD Display

System Time

Bluetooth

The Nerd Session



(Motoren)

forward()
backward()
stop()
reverseDirection()

isMowing()
isStopped()
isRotating()

rotate()
setSpeed()
shutdown()

The Nerd Session



Robotic Classes

Battery Power

Motoren

Buttons

Sound

Sensoren

LCD Display

System Time

Bluetooth

The Nerd Session



Robotic Classes

Battery Power

Motoren

Buttons

Sound

Sensoren

LCD Display

System Time

Bluetooth

The Nerd Session



*java.io.**
*java.net.**



NXTConnector
NXTInfo

Bluetooth
BTConnection

(Bluetooth)



Code Diving ...

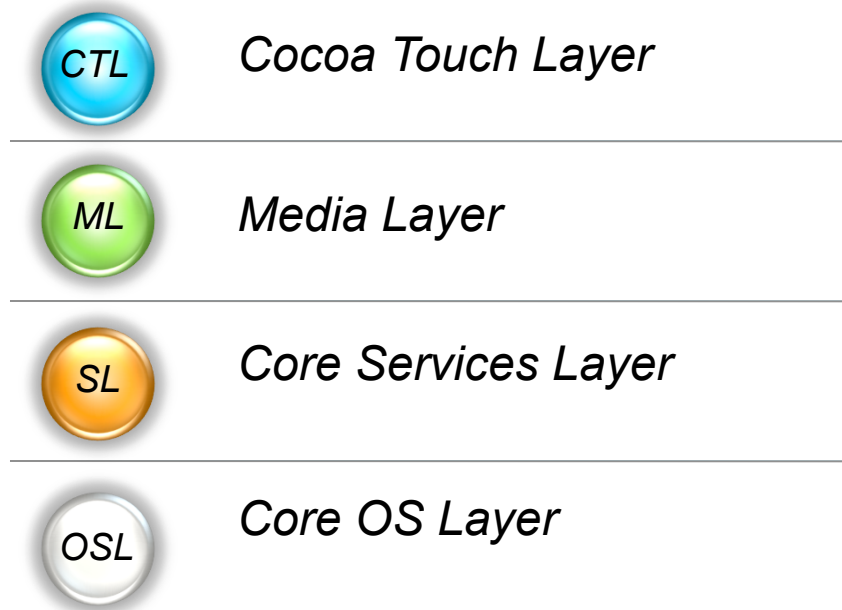
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Lego Mindstorm & Java & iPad



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iOS

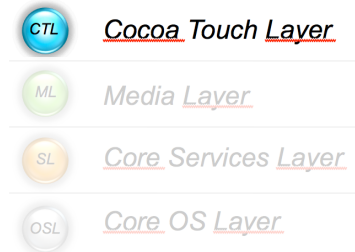


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Cocoa Touch Layer 1/2

- UIKit
 - App Management
 - Graphics & Windowing
 - UI Views & Controls
 - Touch Event Handling
 - Text Handling
 - Web Content
 - Device Feature Bibliotheken
(z.B. Acclerometer, Kamera, Video)

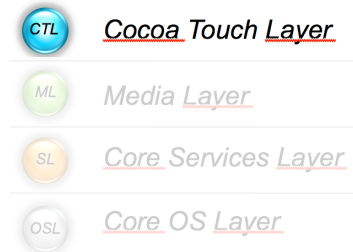


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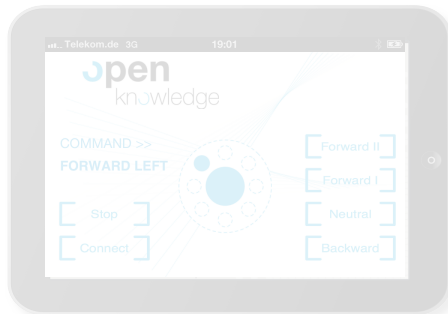
Cocoa Touch Layer 2/2

- Foundation
 - Wrapper Klassen (string, number, binary ...)
 - Collection Klassen (array, sets, dictionary, ...)
 - Bundles (dynamisch geladene App Module)
 - User Preferences
 - Threads & Run Loops
 - File Streams und URLs
 - Bonjour (dynamisches Discovery)



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Lego Mindstorm & Java & iPad



User Interface



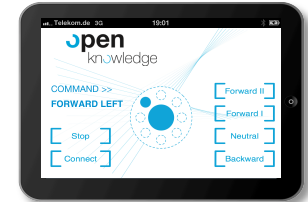
Accelerometer



Connectivity

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Lego Mindstorm & Java & iPad



User Interface

- „Malen“ via IBuilder
- „Programmieren“ via xCode
- „Profilen“ via Instruments



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Lego Mindstorm & Java & iPad



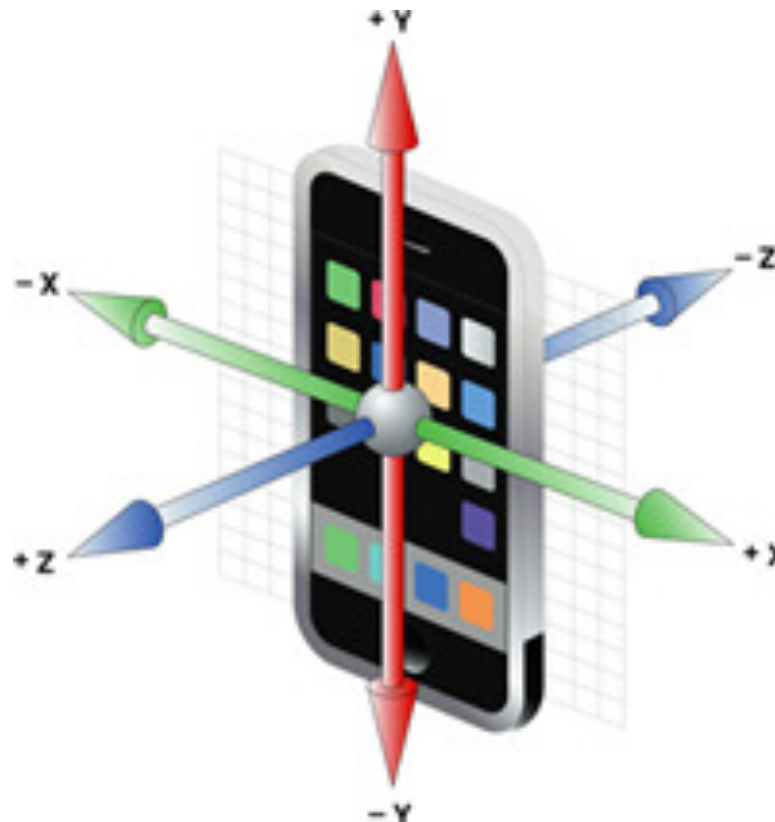
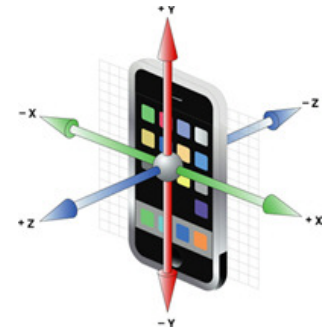
Accelerometer

- liefert X, Y, Z Koordinaten
- eigenes Accelerometer API
- Umrechnung 3D auf 2D notwendig

- Treshold nicht vergessen
- Intervall nicht vergessen

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Lego Mindstorm & Java & iPad



The Nerd Session

Lego Mindstorm & Java & iPad



x: 0.0
y: -1.0
z: 0.0



x: -1.0
y: 0.0
z: 0.0



x: 0.0
y: 0.0
z: -1.0



x: 0.0
y: 1.0
z: 0.0



x: 1.0
y: 0.0
z: 0.0



x: 0.0
y: 0.0
z: 1.0

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Lego Mindstorm & Java & iPad

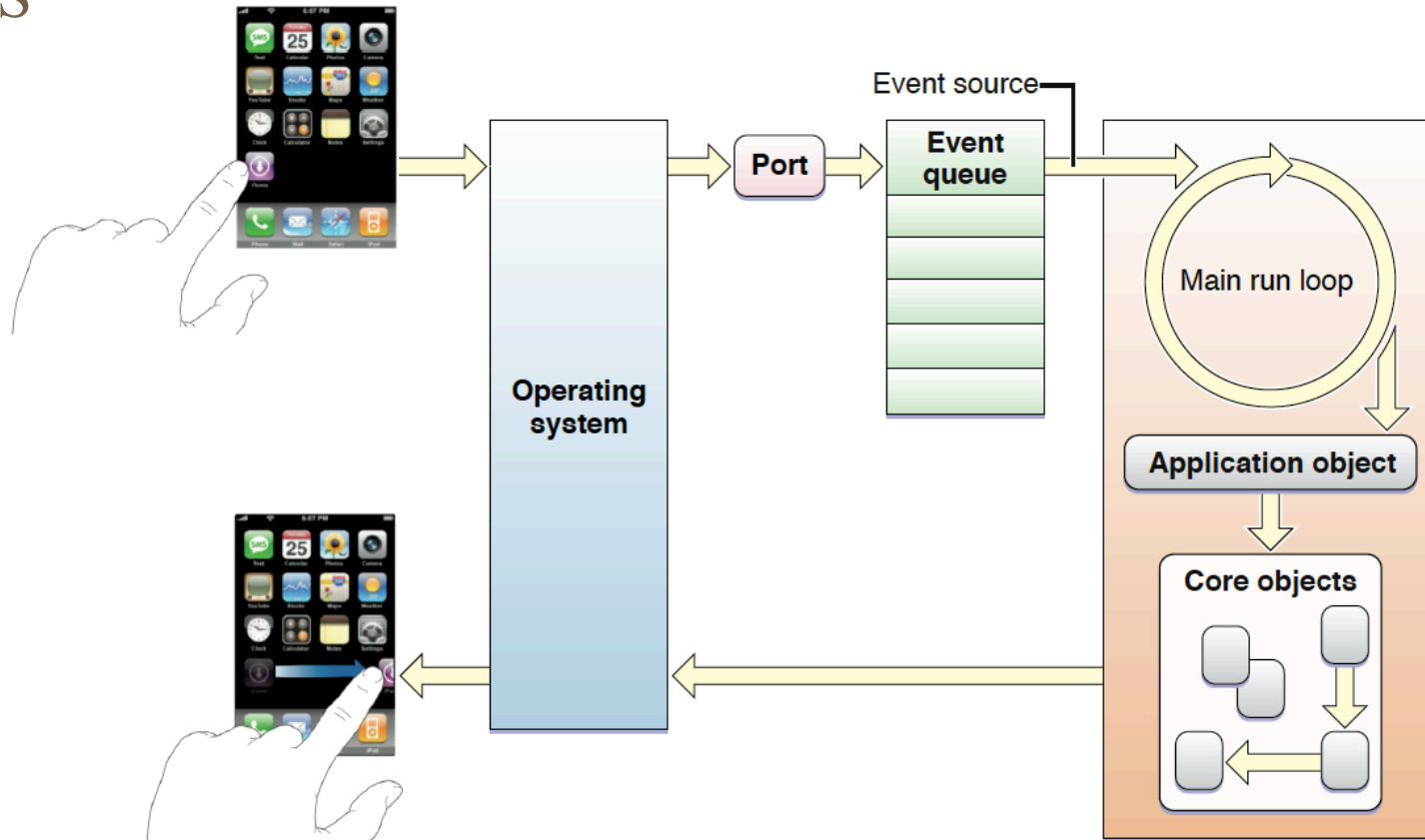


Connectivity

- Socket Connection via CF Klassen
- *CFReadStreamRef*
- *CFWriteStreamRef*
- *CFStreamCreatePairWithSocketToHost*

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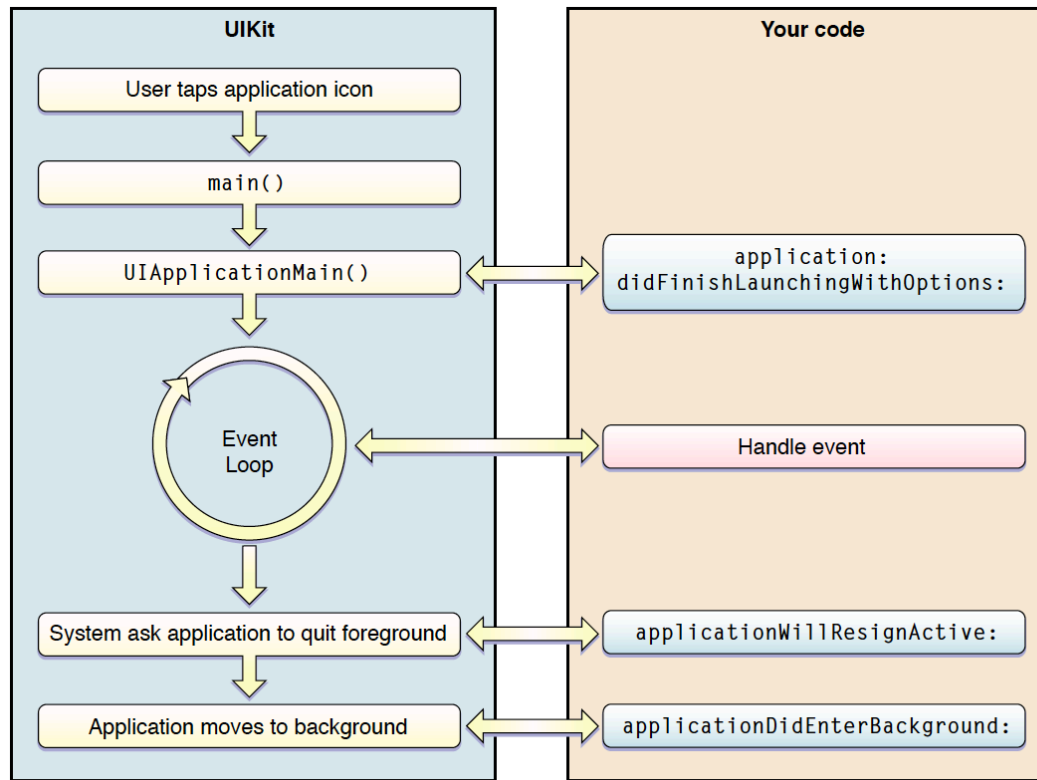
iOS



App Event Loop

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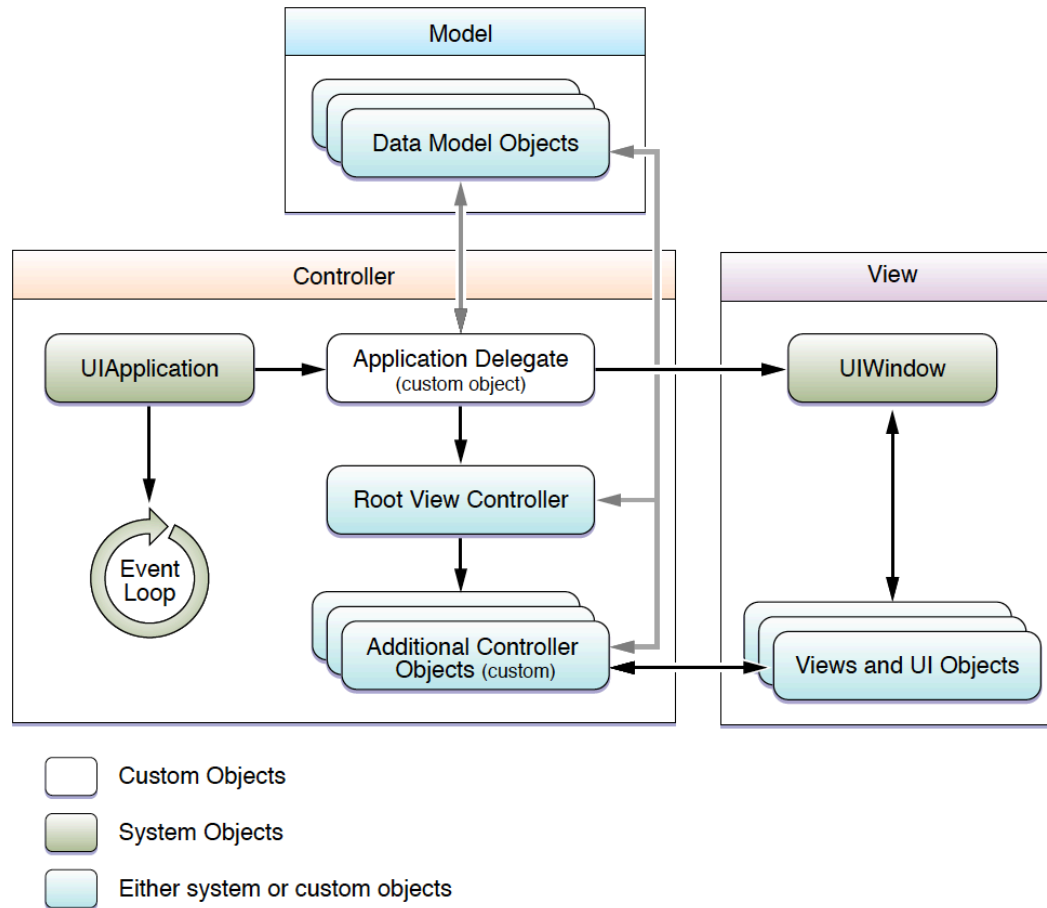
iOS



App LifeCycle

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iOS



Core App Objects



Code Diving ...

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Fazit

- Alles halb so schlimm, aber ...
- ... Lego NXT rocks for kids
- ... leJOS rocks for nerds
- ... Apple BT strategy rocks only for Apple

The Nerd Session

Fazit

- Always keep in mind...
- ... „leJOS“ is on Brick
- ... „iControl“ is of Brick
- ... „your are **not alone**“

- ... „**build cool Stuff and have fun!**“

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Wissenstransfer
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Vielen Dank!

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@_openknowledge
@_tooltime

offenkundiggut

The Nerd Session NXT

