touch develop
productive scripting
ON
mobile devices

Nikolai Tillmann, Michal Moskal, Peli de Halleux, Manuel Fahndrich, Sebastian Burckhardt, Judith Bishop, Tom Ball
Microsoft Research
how to program smartphones + tablets?

how can you turn your ideas into reality?
interfaces having always been changing
touchdevelop: a touch-first IDE

Windows Phone app (2011)

web app (2012)

iPhone, iPad,
Android
Windows, Mac, Linux
Interactive tutorial, language, editor, publishing hub, insights, debugging

tdev.ly/aslwa: Electronic Constructor

tdev.ly/wbxsa: Cloud Hopper

write chat client

tdev.ly/hdbo: Mitingo

Sphero


touchdevelop.com
370,000+ app downloads

140,000+ registered users

50,000+ published scripts

700+ apps in stores
who are our users

total beginners
students
enthusiasts & hobbyists
serious developers
... your name here ...
goal: anyone with a computing device
language + editor

typed language + semi-structured editor

typed, imperative, procedural, data-structures, lambda expressions, module system

expressions edited as token sequences

auto-completion by crowd-sourcing

high-level abstractions
abstract syntax

script ::= meta-info decl*
decl ::= action | page | event | global | library | record
action ::= private? action sig stmt*
event ::= event sig stmt*
page ::= private? page sig init stmt* display stmt*
sig ::= id (id : type)* returns (id : type)*
global ::= var id : type flag*
record ::= cloud? (object | table | index | decorator) keys (id : type)* values (id : type)*
stmt ::= expr // comment | if expr then stmt* else stmt*
        | loop do stmt* | boxed stmt*
loop ::= while expr | for id < expr | for each id in expr
expr ::= token* (where sig stmt*)*
cloud state - eventual consistency made easy

declare shared data (tables, indices) in your script
write code to create view +
attach event handlers

it just works:
data automatically synchronizes and displays
data is replicated locally, always available, even if not connected
zero error handling code
code + run scripts on all devices
access to sensors and data

camera?, touch, accelerometer?, compass?, radio?, gyroscope?, microphone?, location, NFC?, phone?, bluetooth?, contacts?, calendar?, email, pictures?, songs?, web queries, search, maps, social networks, oauth v2, graphics with physics engine, forms with automatic layout, ...

x?: depends on your device/browser

touchdevelop.com/platforms
touch
develop

education
touchdevelop + education = ❤❤❤❤

Bring Your Own Device (BYOD)

students can bring their own phone, tablet, laptop (or use a provided PC)
students can keep working at home, and show results to family and fields

cross-platform

touchdevelop fits today’s heterogeneous reality
workshops, conferences
DeMobile @ FSE’13, MobileDeLi, ProMoTo @ SPLASH’13, MOBILESof’14 @ ICSE’14

University collaborations
University of Newcastle (Australia), Drew University, University of Maryland, University of Calgary (Canada), Graz Univ. of Technology (Austria), IIT-Delhi (India), University of Illinois in Urbana Champaign, University of California in Santa Cruz

High school collaboration
Rainier Beach High School

book, courses, tutorials
Rainier Beach High School organized the first **App Day** on May 23, 2013. More than 500 students from 17 schools attended the event! [video][appday.org]
code.org is soliciting tutorials for “hour of code”, a campaign to inspire TEN MILLION students to learn to code

“Microsoft, Google, Apple, Amazon, Bill Gates, Mark Zuckerberg, Jack Dorsey Among Those Joining Campaign”

touchdevelop.com/hoc
touch develop research
high-velocity research platform

IDE powered by the **cloud**

**data mining**: 1,000+ active user every day, 3,000,000+ program snapshots

social features (sharing, attribution, discussions, ...)

**information-flow** analysis to deal with privacy concerns

**crowd-sourced** profiling, code coverage, crash reporting

ranking of code by **novelty**

**live programming**

debugging on mobile devices

code-completion hints (**intellibuttons**) based on code mining

cloud-based **code synthesis** from keywords

**cloud state**

**adaptive tutorials**
Sihan Li, Tao Xie, and Nikolai Tillmann
A Comprehensive Field Study of End-User Programming on Mobile Devices, in **VL/HCC 2013**

Sebastian Burckhardt, Manuel Fahndrich, Jonathan de Halleux, Jun Kato, Sean McDirmid, Michal Moskal, Nikolai Tillmann
It is alive! Continuous Feedback in UI Programming, in **PLDI 2013**

Tuan A. Nguyen, Christoph Csallner, and Nikolai Tillmann
GROPG: A graphical on-phone debugger, in **ICSE NIER 2013**

Xusheng Xiao, Nikolai Tillmann, Manuel Fahndrich, Jonathan de Halleux, and Michal Moskal,
User-Aware Privacy Control via Extended-Static-Information-Flow Analysis, in **ASE 2012**

Nikolai Tillmann, Michal Moskal, Jonathan de Halleux, Manuel Fahndrich, Judith Bishop, Arjmand Samuel, and Tao Xie,
The Future of Teaching Programming is on Mobile Devices, in **ITiCSE 2012**

Sebastian Burckhardt, Manuel Fahndrich, Daan Leijen, and Benjamin P. Wood,
Cloud Types for Eventual Consistency, in **ECOOP 2012**

Tuan A. Nguyen, Sarker T.A. Rumee, Christoph Csallner, and Nikolai Tillmann,
An experiment in developing small mobile phone applications comparing on-phone to off-phone development, in **USER 2012**

Marat Akhin, Nikolai Tillmann, Manuel Fahndrich, Jonathan de Halleux, and Michal Moskal,
Search by Example in TouchDevelop: Code Search Made Easy, in **SUITE 2012**

Nikolai Tillmann, Michal Moskal, Jonathan de Halleux, and Manuel Fahndrich,
TouchDevelop: programming cloud-connected mobile devices via touchscreen, in **ONWARDS 2011**
many open challenges...

plug-ins for cloud development
mining data to help new users learn programming,
clone detection, analyze small incremental changes, gamification

leverage structured program code repository
better version control (diff, merge), real-time collaborative editing

our current research focus
collaborative editing, automatic code splitting for distributed execution (mobile vs. cloud),
direct editing of JavaScript or TypeScript

... your research here ...
REST-based service APIs at [http://touchdevelop.com/api/](http://touchdevelop.com/api/)

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touchdevelop: a cloud-based mobile IDE

re-envisioned programming experience in a world of devices
develop and run everywhere

opportunity in education

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touch develop

code-a-thon
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