July 27, 2012
TinkerBlocks

# App Inventor Development

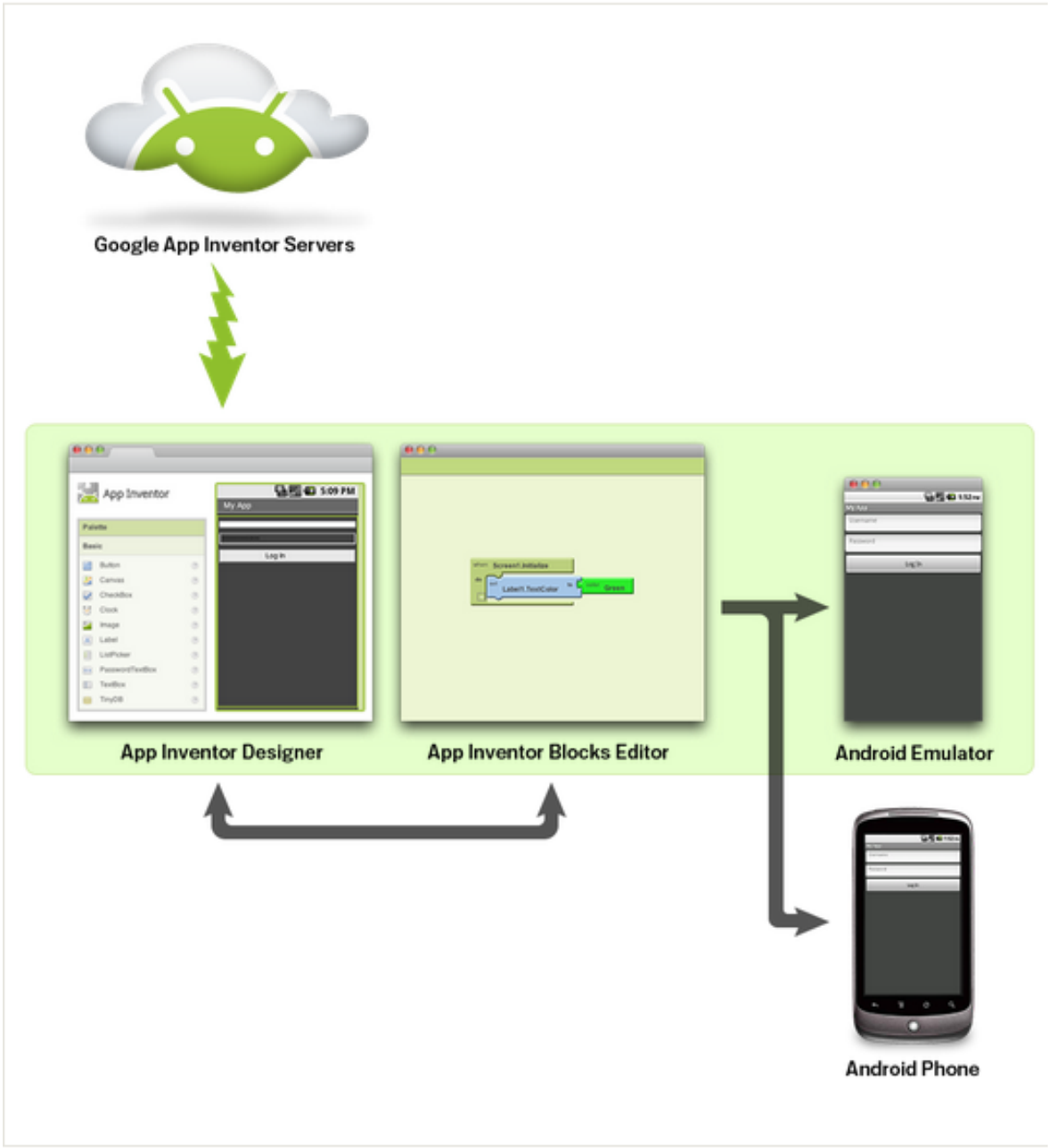
## Wellesley Science Center Summer Research

Karishma Chadha, Erin Davis
Emily Erdman, Johanna Okerlund

Supervised by Lyn Turbak

# Our Presentation

- Introduction to App Inventor
- Posting Pictures (OAuth)- Emily
- Blocks to Text- Erin
- Text to Blocks- Karishma
- Data Mining- Johanna


Google App Inventor Servers
App Inventor Designer
App Inventor Blocks Editor
Android Emulator
Android Phone

New course

# Fall 2011
# CS117:
# Inventing Mobile Apps

No prior programming experience allowed

## Create apps for Android phones:

- games
- animations
- location-aware apps
- map-based apps
- quizzes & voting
- web processing
- augmented reality
- social networking

Lectures: Mon/Thu 1:30-2:40

Labs: Wed 11:10-12:20
or Wed 2:50-4

For more information:
http://cs.wellesley.edu/~cs117

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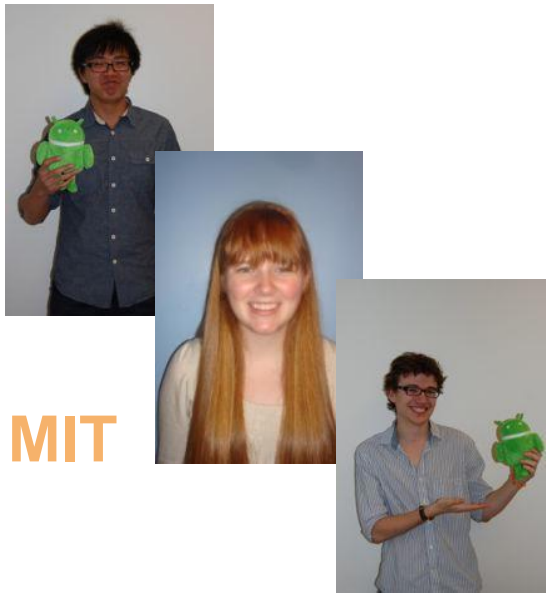
skakavou@ wellesley.edu

Use Android phones from the library

MM distribution

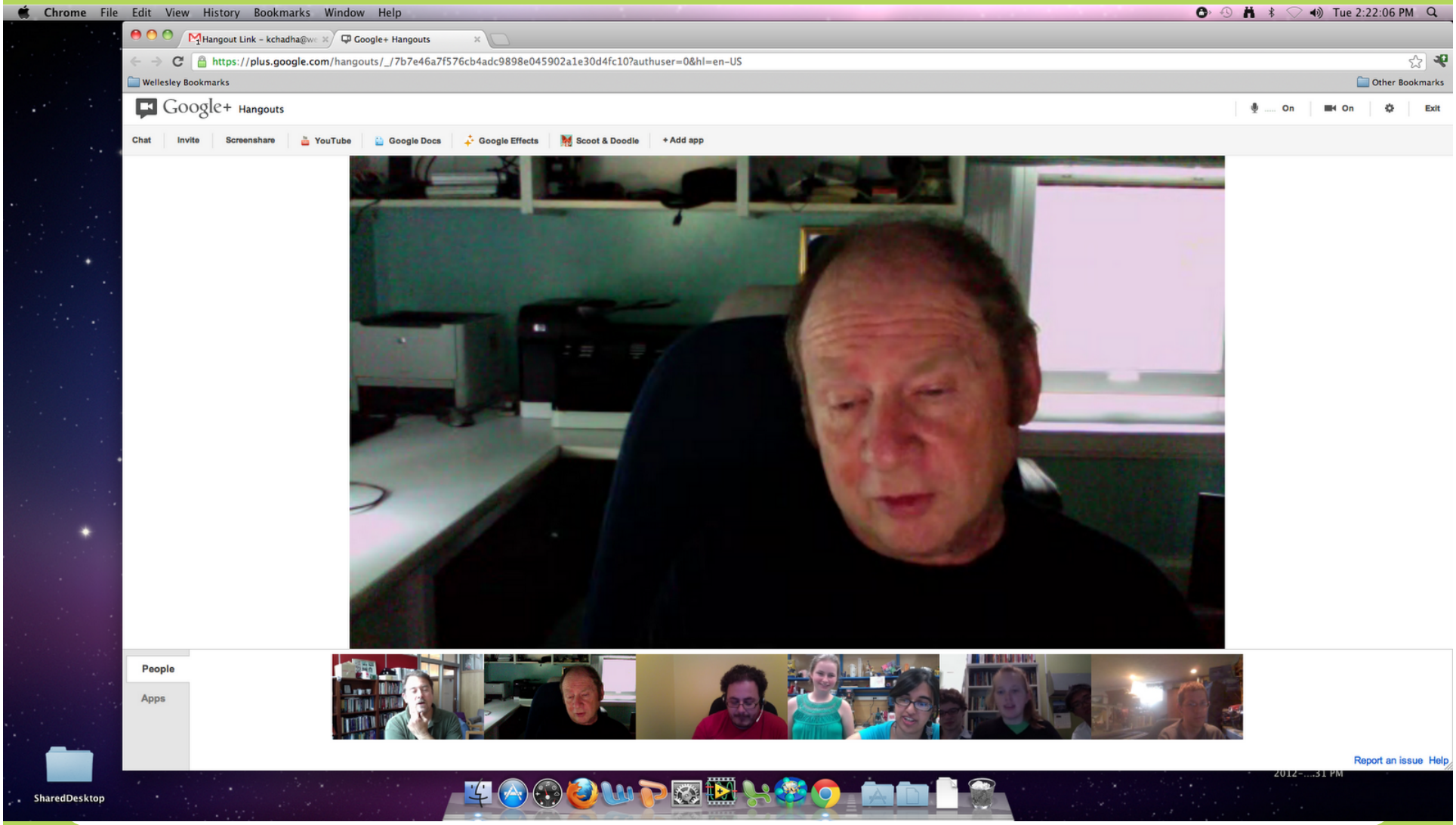
# App Inventor Development Team



MIT

GSOC

# Google Hangouts



# App Inventor Summit

- July 13-14 at MIT
- In attendance:
  - App Inventor Users
  - Teachers using App Inventor
  - Developers

- Presented our progress so far
- Discussed the future of App Inventor

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# First App Inventor Dev Team Task

- Issues for everyone!

app-inventor

Home of the App Inventor for Android project

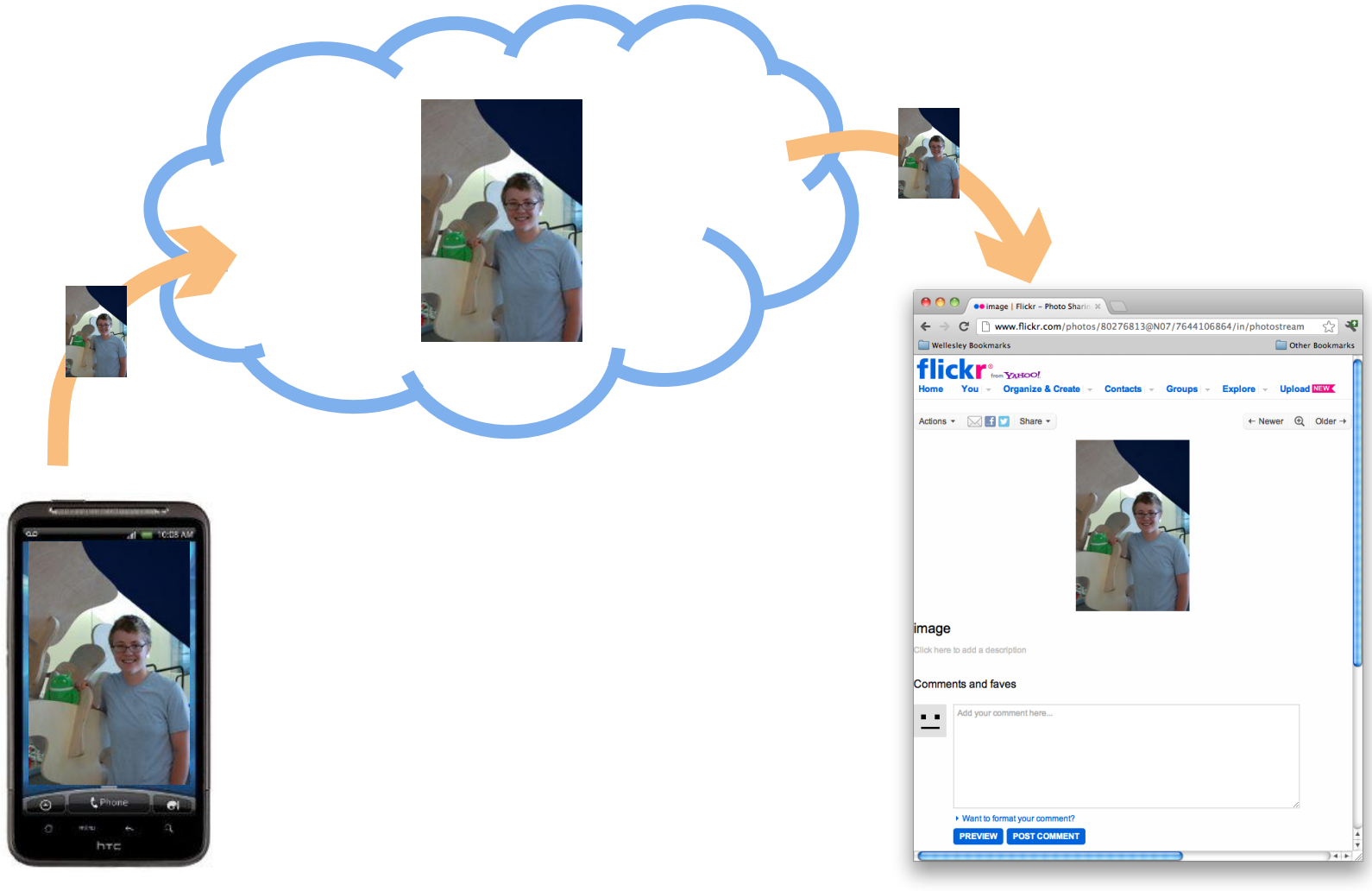
Project Home | Downloads | Wiki | **Issues** | Source

New issue | **Search** | Open issues | **for**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ☆ | 164 | Defect | Accepted | Medium | ---- | pasin30055 | create proposal for letting users add items tothe notification bar | halatmitdotedu | 1 |
| ☆ | 166 | Documentation | Started | Medium | ---- | eerdman@wellesley.edu | Write documentation on how to use POST | halatmitdotedu | 1 |
| ☆ | 173 | Defect | New | Medium | ---- | ---- | Figure out how to make GWTTestCase work with our build | sharon@google.com | 1 |

Show people how to use HTTP POST in the Web Component to post text and pictures to the internet.

# What about posting pictures?



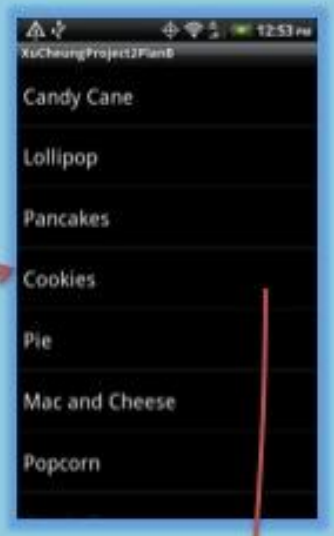
# User Manual

# storyBOOk

Sarah Xu
Sinead Cheung
CS 117: Inventing Mobile Apps

Pencil
Eraser
Background
The sun was shining on the awesome tree.
Save Progress
Review Progress
New Page
Publish My Book

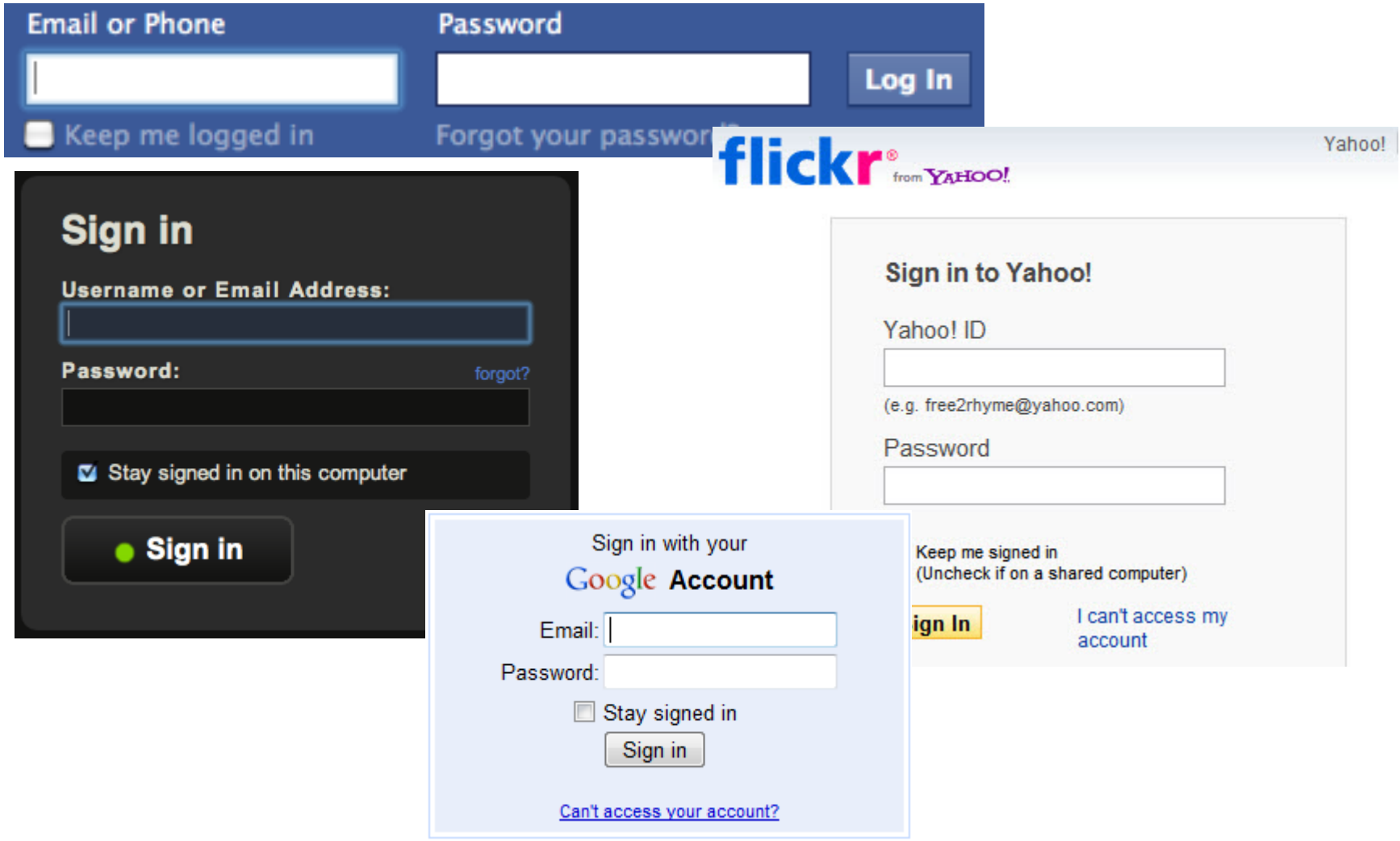
Want to choose a picture?



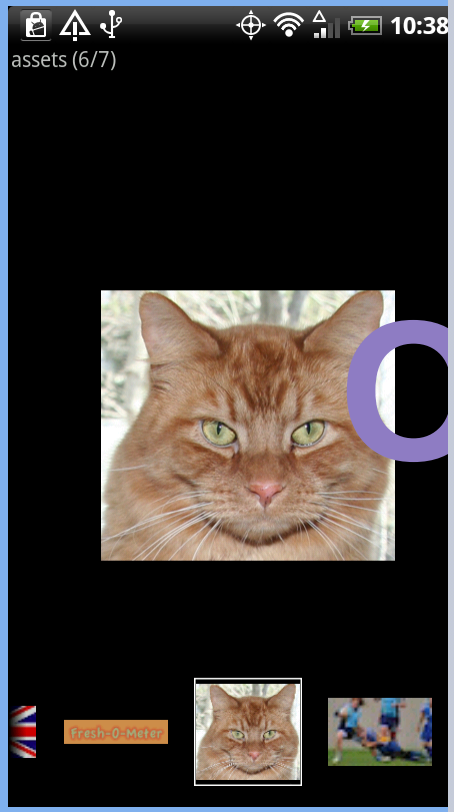

Choose a picture from the list and it will be displayed right away

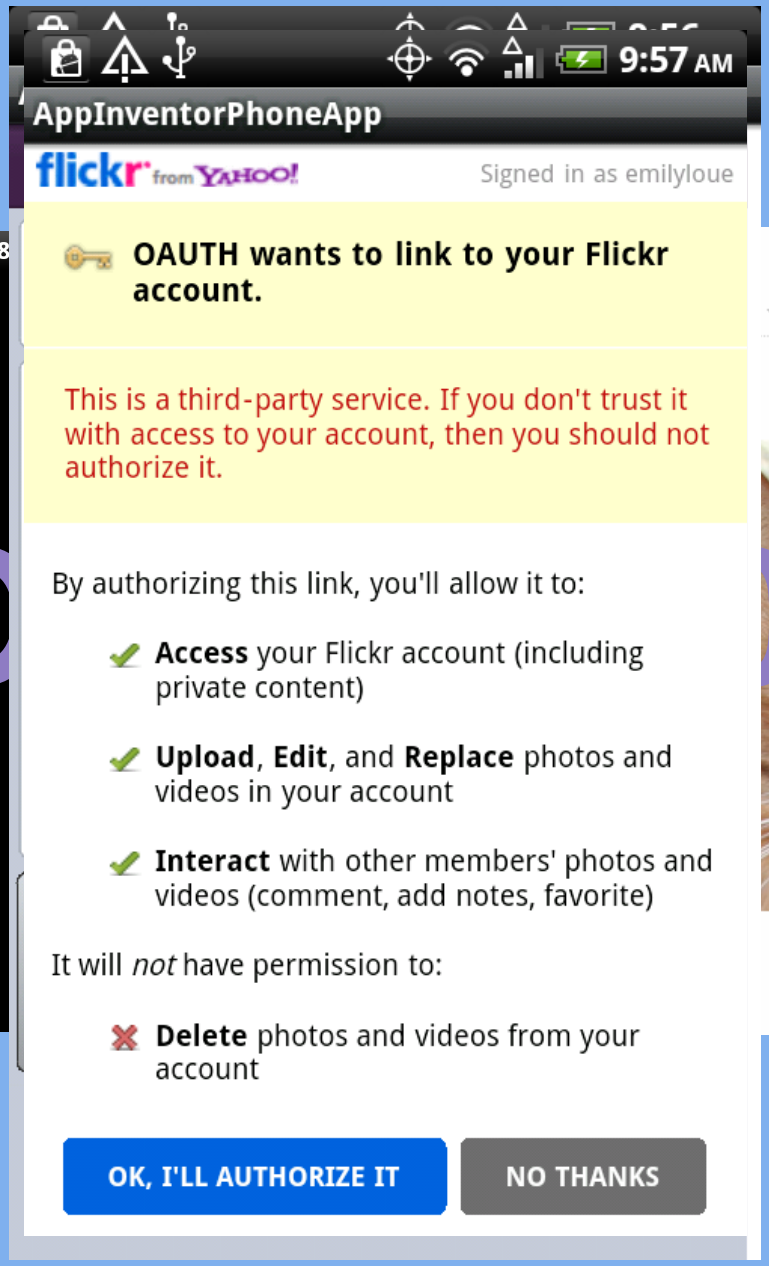
# Photo Sharing Sites

# Where do I post?



# My Nemesis


10:38
assets (6/7)
Fresh-O-Meter


9:57 AM
AppInventorPhoneApp
flickr from YAHOO!
Signed in as emilyloue
OAUTH wants to link to your Flickr account.
This is a third-party service. If you don't trust it with access to your account, then you should not authorize it.
By authorizing this link, you'll allow it to:
Access your Flickr account (including private content)
Upload, Edit, and Replace photos and videos in your account
Interact with other members' photos and videos (comment, add notes, favorite)
It will not have permission to:
Delete photos and videos from your account
OK, I'LL AUTHORIZE IT
NO THANKS

Groups
Explore
Upload NEW

flickr

the simple image sharer
imgur

# Itty Bitty Details (With HUGE Consequences)

- Each request sent to the service provider must be signed with HMAC-SHA1 encryption.

# Signing a Request

- Base String = Method&RequestURL&QueryParameters(alphabetically)
- Signing Key = ConsumerSecret&TokenSecret

GET&http%3A%2F%2Fwww.flickr.com%2Fservices%2Foauth%2Faccess_token&oauth_callback%3Dhttp%253A%252F%252Fwww.google.com%26oauth_consumer_key%3Dc892f1ed8dcd7cd39dd3ede25d261b08%26oauth_nonce%3D5154d383187181b5%26oauth_signature_method%3DHMAC-SHA1%26oauth_timestamp%3D1343317580%26oauth_token%3D72157630761601954-818d6eb500c5e4a1%26oauth_verifier%3D4b4f7d3624ce5d3f%26oauth_version%3D1.0

+

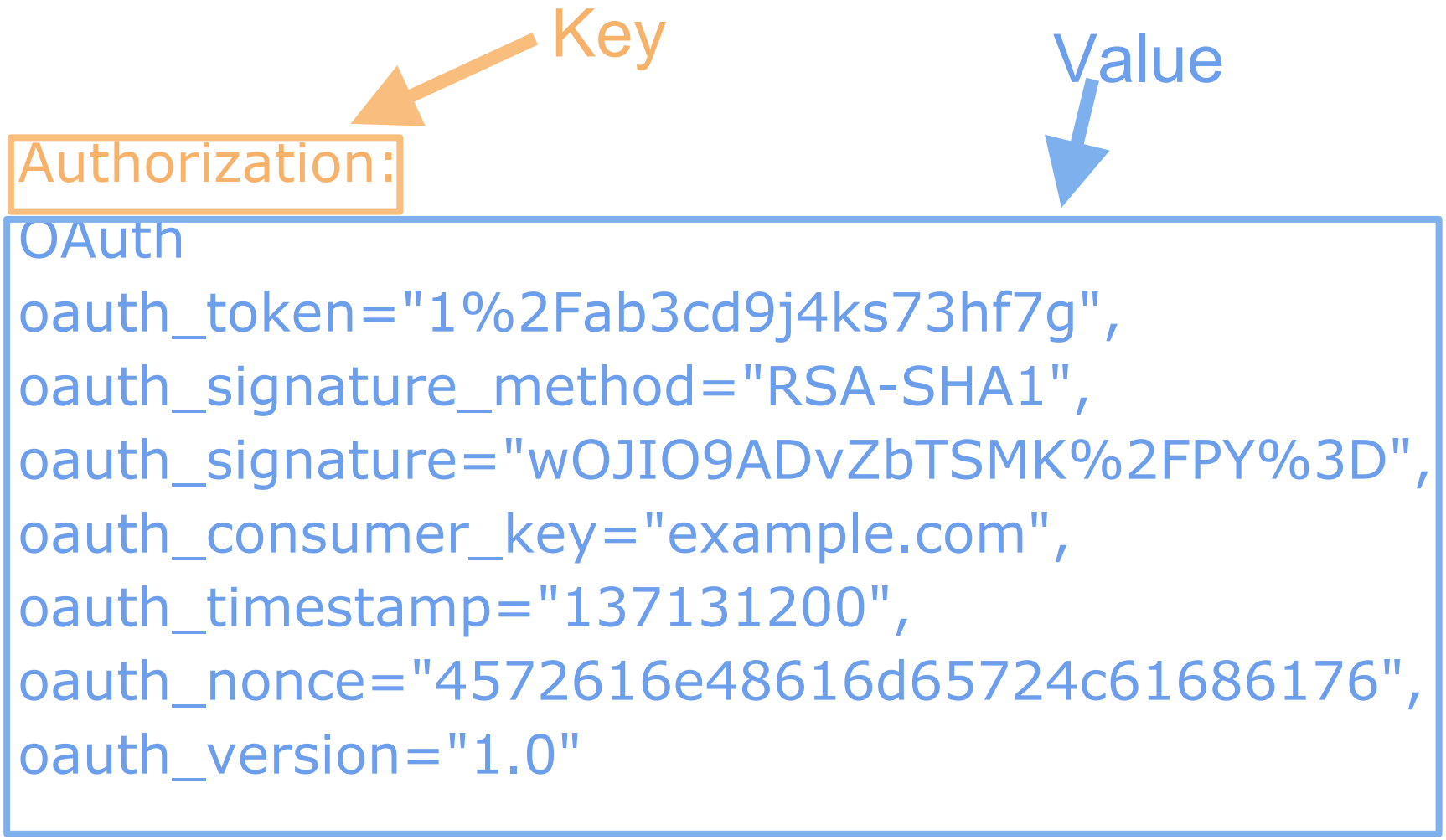
39215edf4e40636f&0e571aecc224a169

---

6MJLN1klR9nmIltYU4F5dkHYRco=

# Itty Bitty Details (With HUGE Consequences)

- Each request sent to the service provider must be signed with HMAC-SHA1 encryption.
- In Android < 2.2, HttpURLConnection sets request headers to lower case.

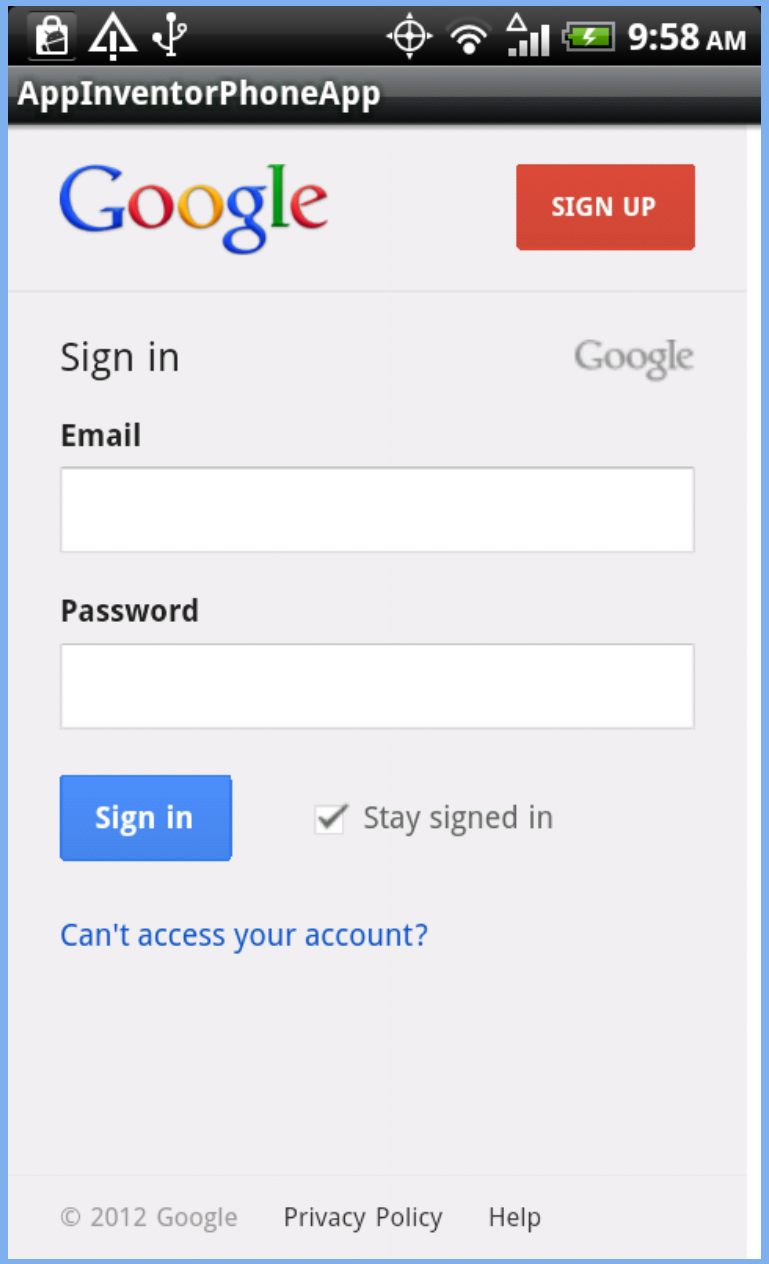

Key
Value
Authorization:
OAuth
oauth_token="1%2Fab3cd9j4ks73hf7g",
oauth_signature_method="RSA-SHA1",
oauth_signature="wOJIO9ADvZbTSMK%2FPY%3D",
oauth_consumer_key="example.com",
oauth_timestamp="137131200",
oauth_nonce="4572616e48616d65724c61686176",
oauth_version="1.0"

# Itty Bitty Details (With HUGE Consequences)

- Each request sent to the service provider must be signed with HMAC-SHA1 encryption.
- In Android < 2.2, HttpURLConnection sets request headers to lower case.
- Formatting a multipart post body message.

```
POST /services/upload/ HTTP/1.1
Content-Type: multipart/form-data; boundary=--------------------------7d44e178b0434
Host: api.flickr.com
Content-Length: 35261

----------------------------7d44e178b0434
Content-Disposition: form-data; name="api_key"

3632623532453245
----------------------------7d44e178b0434
Content-Disposition: form-data; name="auth_token"

436436545
----------------------------7d44e178b0434
Content-Disposition: form-data; name="api_sig"

437328509327465732 45
----------------------------7d44e178b0434
Content-Disposition: form-data; name="photo"; filename="C:\test.jpg"
Content-Type: image/jpeg

{RAW JFIF DATA}
----------------------------7d44e178b0434--
```

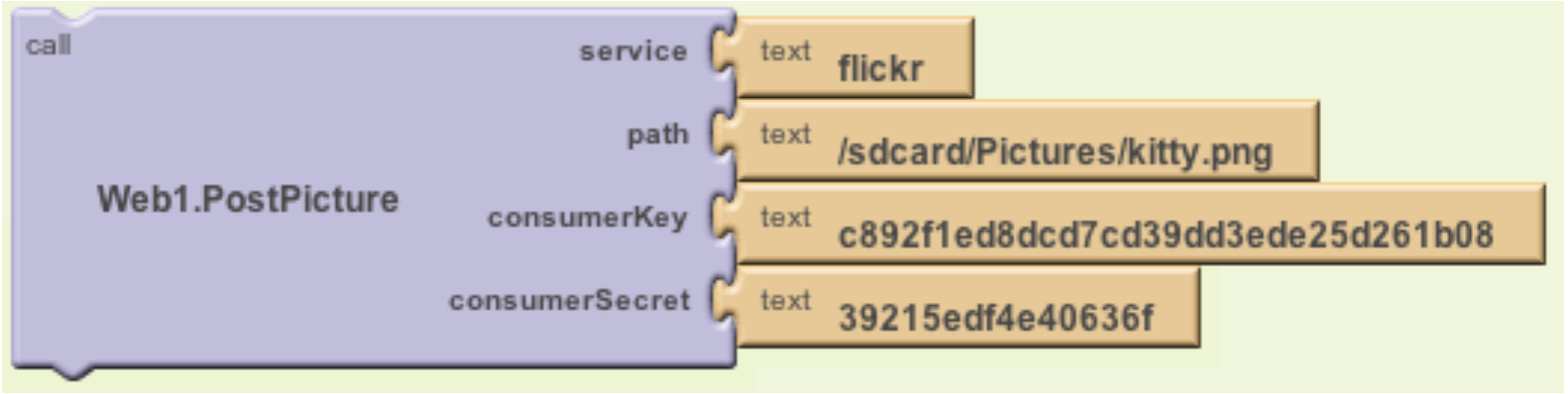
# OAuth 2.0

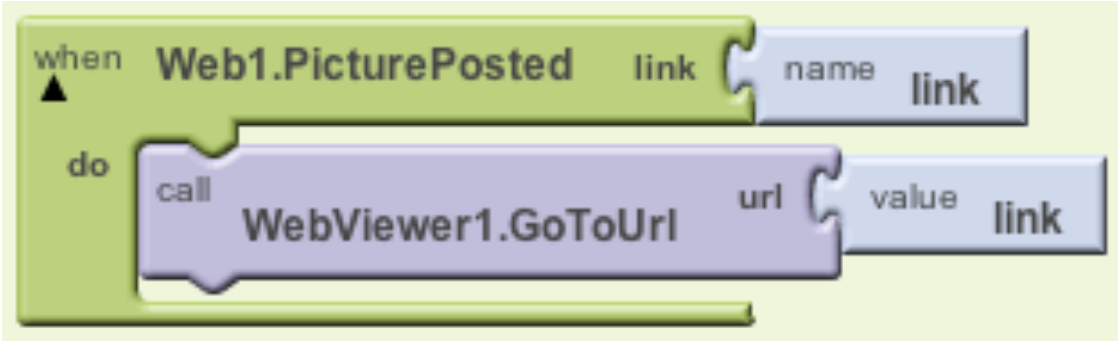

9:58 AM
AppInventorPhoneApp
Google
SIGN UP
Sign in
Google
Email
Password
Sign in
Stay signed in
Can't access your account?
© 2012 Google
Privacy Policy
Help

facebook

Picasa™

# 10 weeks for this:



# What's Next?

- Finish up the PostPicture block for Flickr, Picasa, Facebook, and Imgur.
- Write documentation on how to use the block.
- OAuth Component

# Our Presentation

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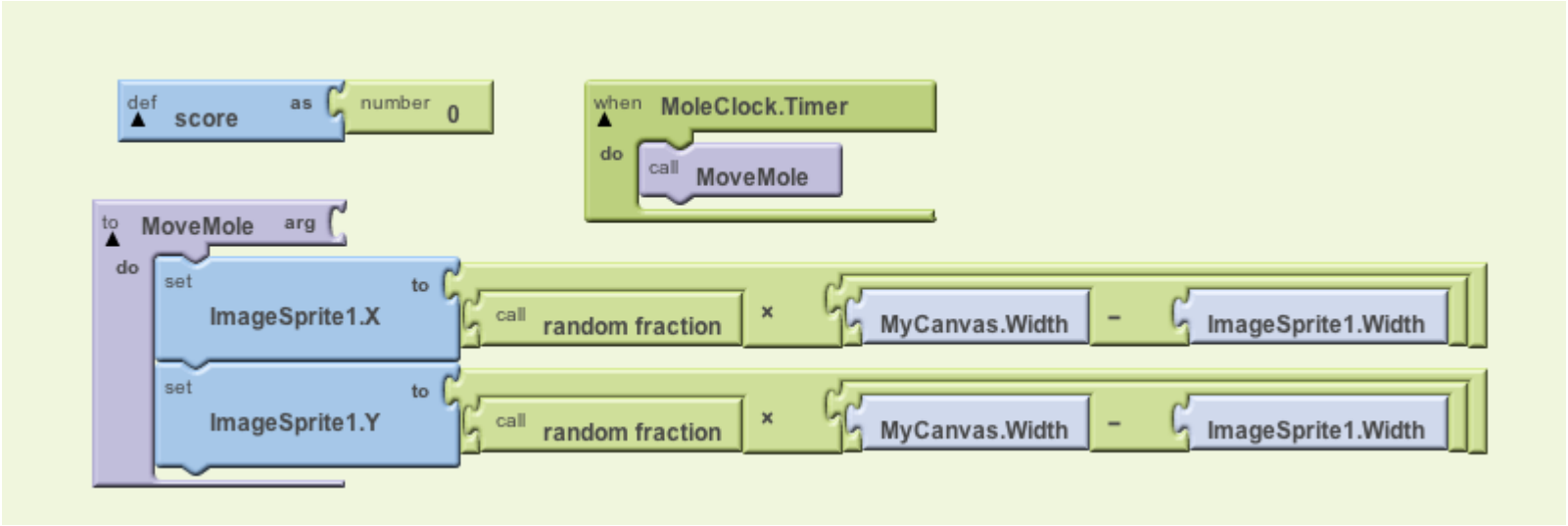
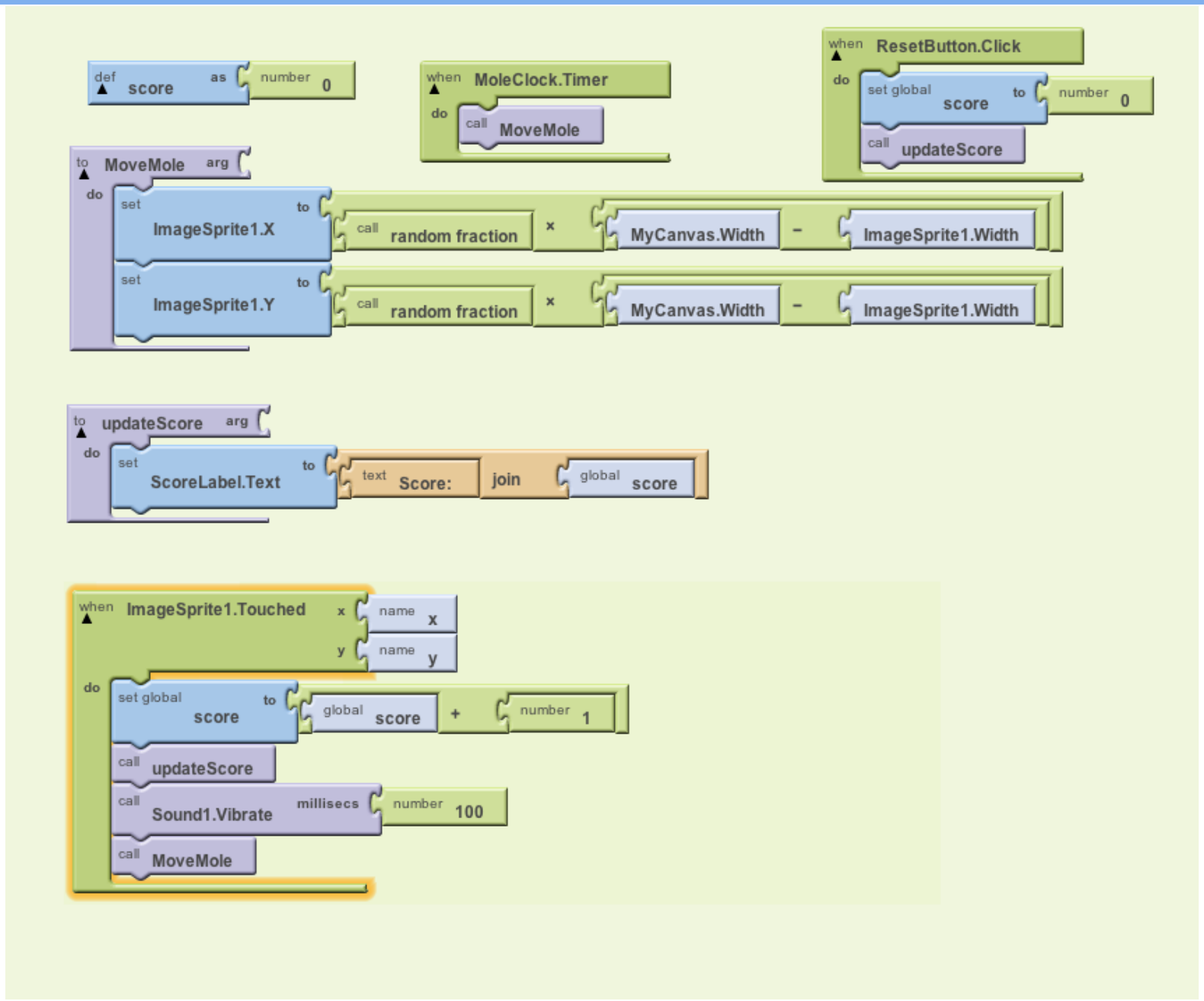
# Blocks Text

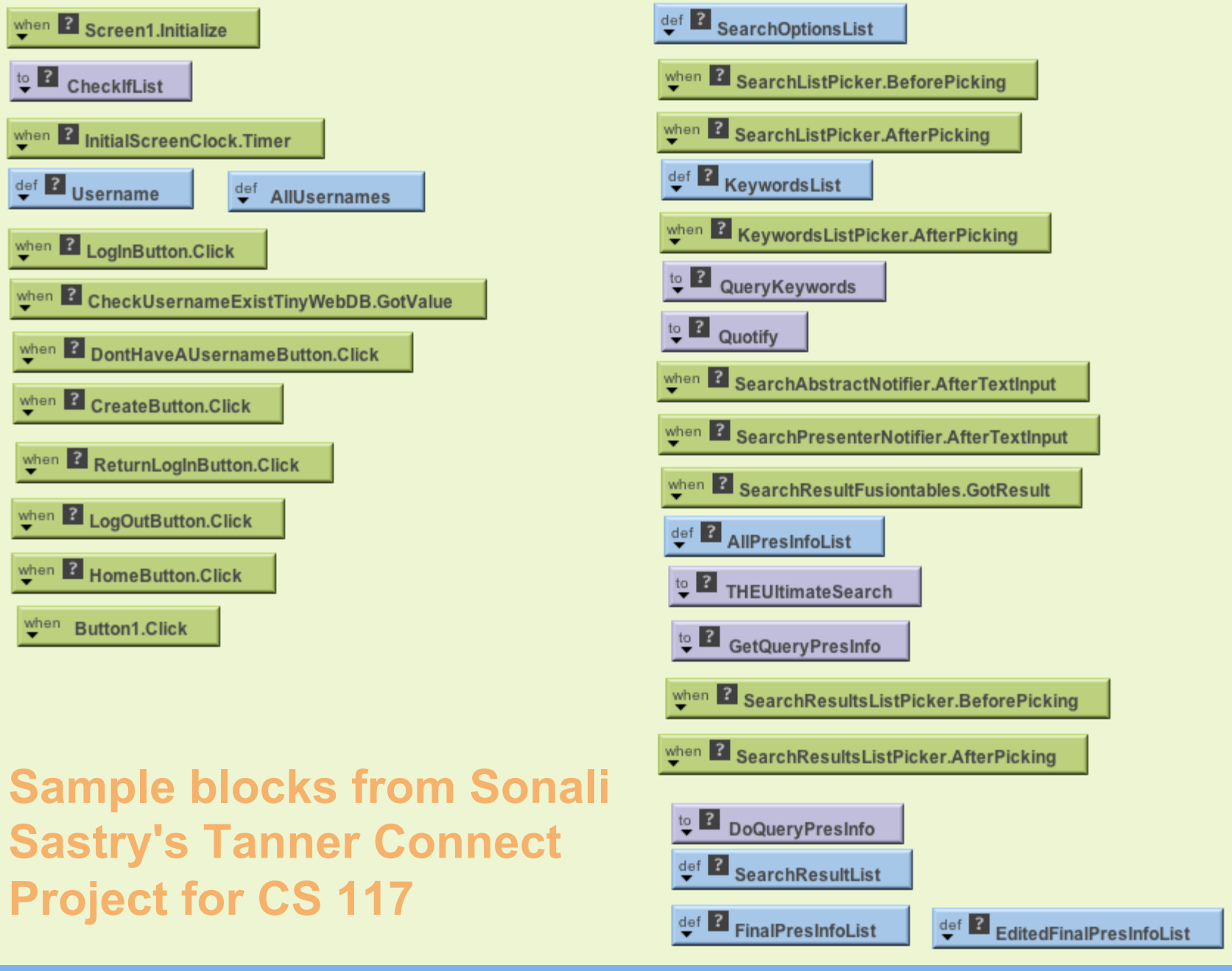
Erin Davis

# Motivation

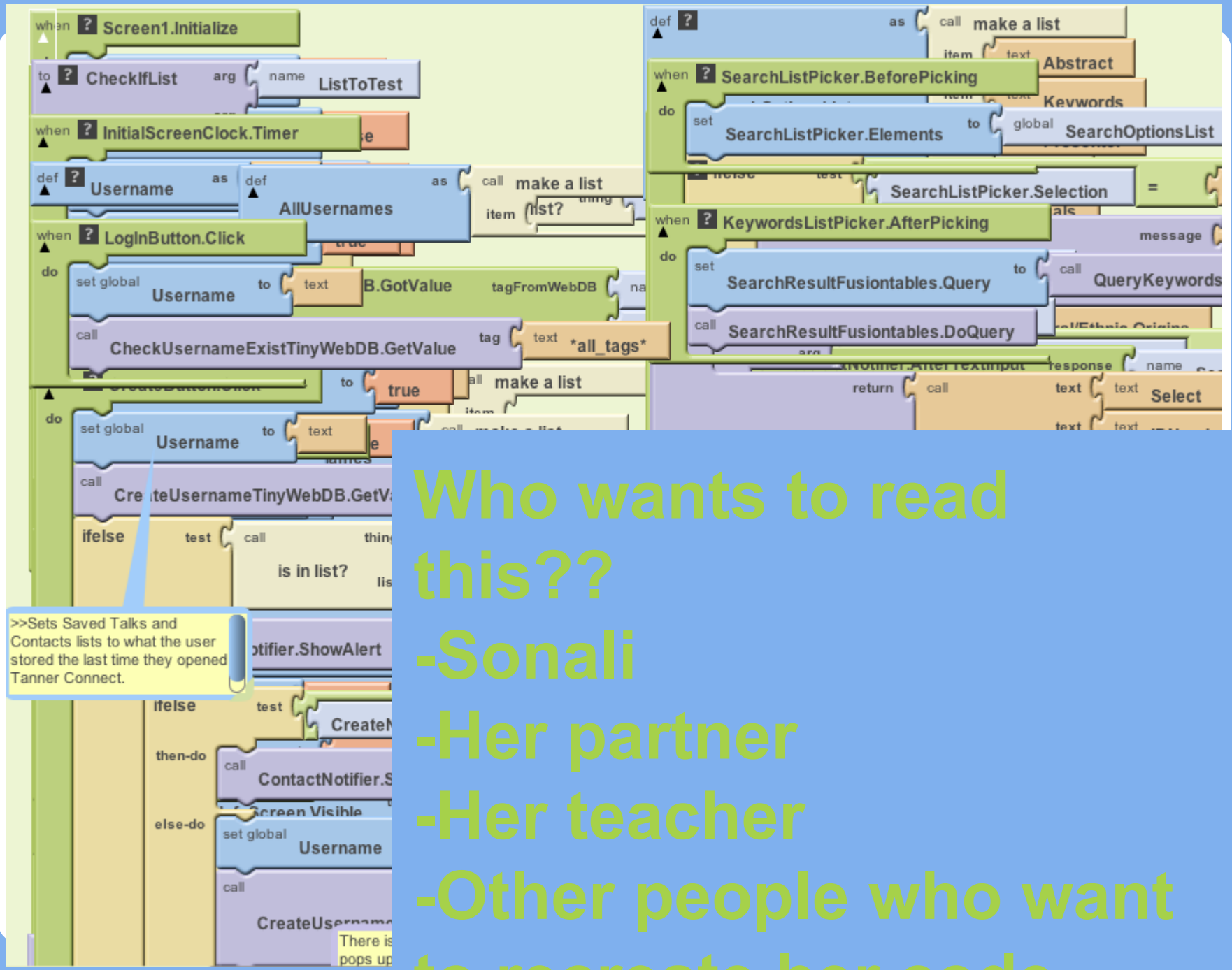
- Blocks-based programming is fun and easy, but as programs get larger...



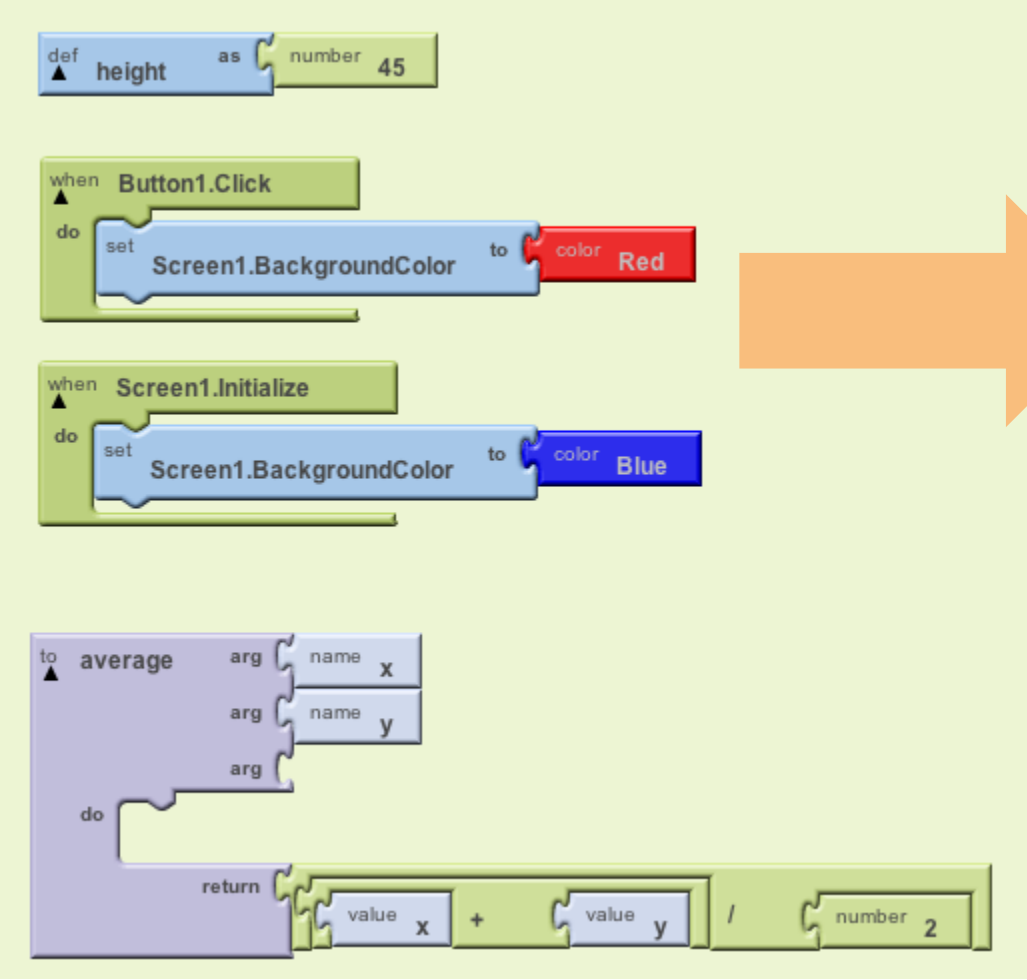

def score as number 0
when MoleClock.Timer
do call MoveMole
when ResetButton.Click
do set global score to number 0
call updateScore
to MoveMole arg
do set ImageSprite1.X to call random fraction × MyCanvas.Width − ImageSprite1.Width
set ImageSprite1.Y to call random fraction × MyCanvas.Width − ImageSprite1.Width
to updateScore arg
do set ScoreLabel.Text to text Score: join global score
when ImageSprite1.Touched x name x y name y
do set global score to global score + number 1
call updateScore
call Sound1.Vibrate millisecs number 100
call MoveMole




# Sample blocks from Sonali Sastry's Tanner Connect Project for CS 117


when Screen1.Initialize
to CheckIfList arg name ListToTest
when InitialScreenClock.Timer
def Username as
def AllUsernames as
call make a list
item list?
when LogInButton.Click
do
set global Username to text
B.GotValue tagFromWebDB
call CheckUsernameExistTinyWebDB.GetValue tag text *all_tags*
to true
call make a list
do
set global Username to text
call CreateUsernameTinyWebDB.GetV
ifelse test call
is in list?
>>Sets Saved Talks and Contacts lists to what the user stored the last time they opened Tanner Connect.
otifier.ShowAlert
ifelse test
then-do call ContactNotifier.S
else-do set global Username
call CreateUsernam
There is pops up
def as call make a list
item text Abstract
when SearchListPicker.BeforePicking
do set SearchListPicker.Elements to global SearchOptionsList
SearchListPicker.Selection =
when KeywordsListPicker.AfterPicking
do set SearchResultFusiontables.Query to call QueryKeywords
call SearchResultFusiontables.DoQuery
return call text text Select
Who wants to read this??
-Sonali
-Her partner
-Her teacher
-Other people who want to recreate her code

# Our Solution




## TEXT

```
height = 45

when Button1.Click():

Screen1.BackgroundColor =
color.red

when Screen1.Initialize():

Screen1.BackgroundColor =
color.blue

fun average(x, y)=
                (x+y)/2
```

more concise
searchable

# What should Our Text Language Be?

```
height = 45

when Button1.Click():
        Screen1.BackgroundColor = color.red

when Screen1.Initialize():
        Screen1.BackgroundColor = color.blue

fun average(x, y)=
        (x+y)/2
```

express all of the functionality of AppInventor

Python-esque syntax

originally proposed by Philip Guo at MIT

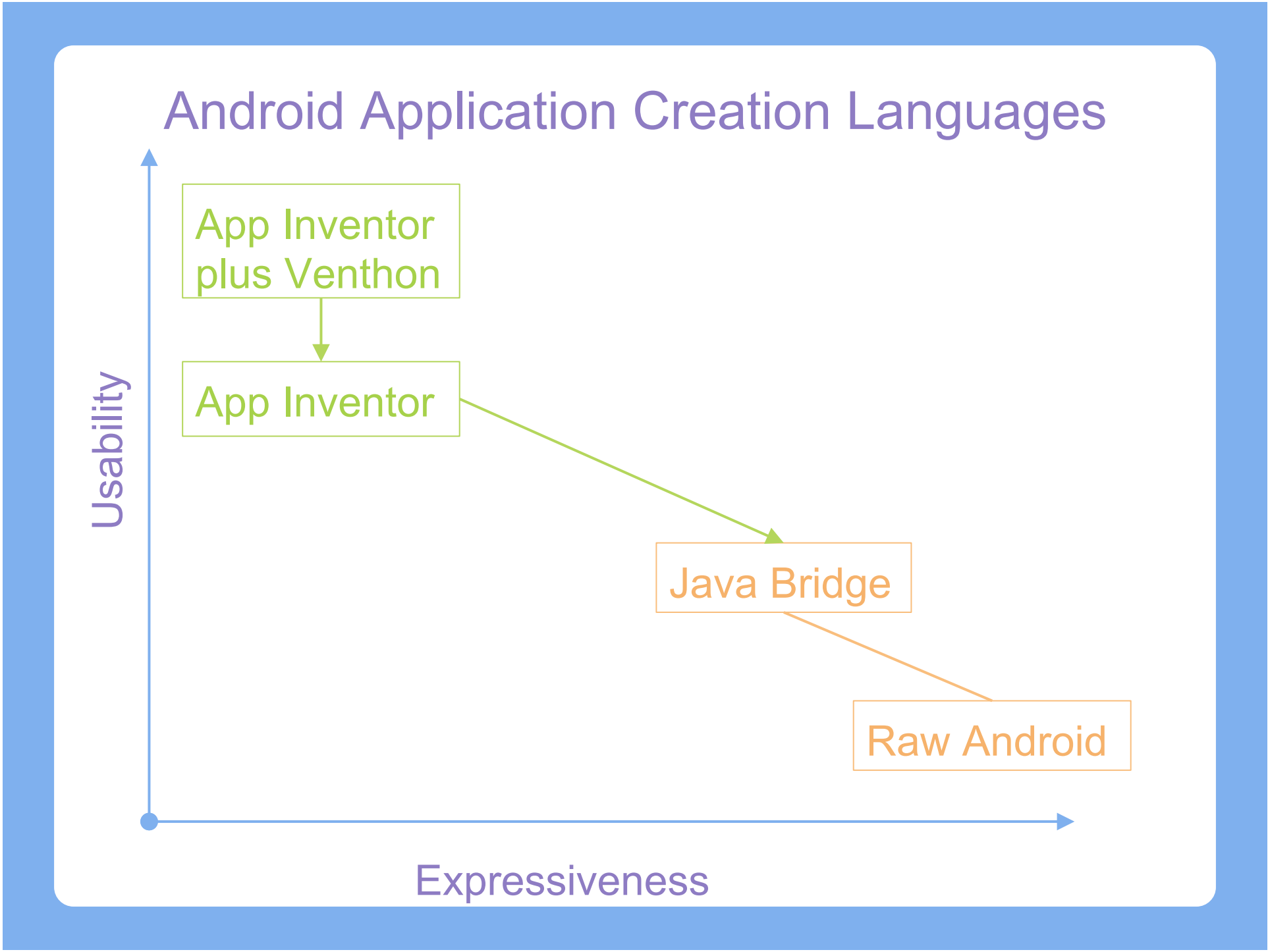
-fewer syntactic markers

-indentation used

**App Inventor + Python**

**Venthon**

could be the first of many textual representations of App Inventor


Android Application Creation Languages
App Inventor
plus Venthon
App Inventor
Java Bridge
Raw Android
Usability
Expressiveness

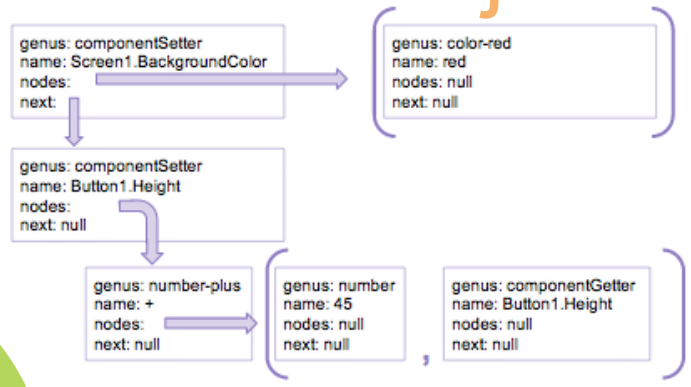
# From Blocks to Text

## Blocks

```
height = 45

when Button1.Click():
        Screen1.BackgroundColor =
color.red

when Screen1.Initialize():
        Screen1.BackgroundColor =
color.blue

fun average(x, y)=
        (x+y)/2
```

## Venthon

## Java Tree Object




```
[{genus: componentSetter
 name: "Screen1.BackgroundColor"
 sockets:
                [{genus: color-red
                 name: "color.red"
                 sockets: []}]},
{genus: componentSetter
 name: Button1.Height
sockets:
                [{genus: number-plus
                  name: "+"
                  sockets:
                                [{genus: number
                                  name: 45
                                  sockets: []},
                                 {genus: componentGetter
                                  name: Button1.Height
                                  sockets: []}]}]}]
```

## JAIL

**JSON App Inventor Language**

genus: componentSetter
name: Screen1.BackgroundColor
nodes:
next:

genus: color-red
name: red
nodes: null
next: null

genus: componentSetter
name: Button1.Height
nodes:
next: null

genus: number-plus
name: +
nodes:
next: null

genus: number
name: 45
nodes: null
next: null

,

genus: componentGetter
name: Button1.Height
nodes: null
next: null

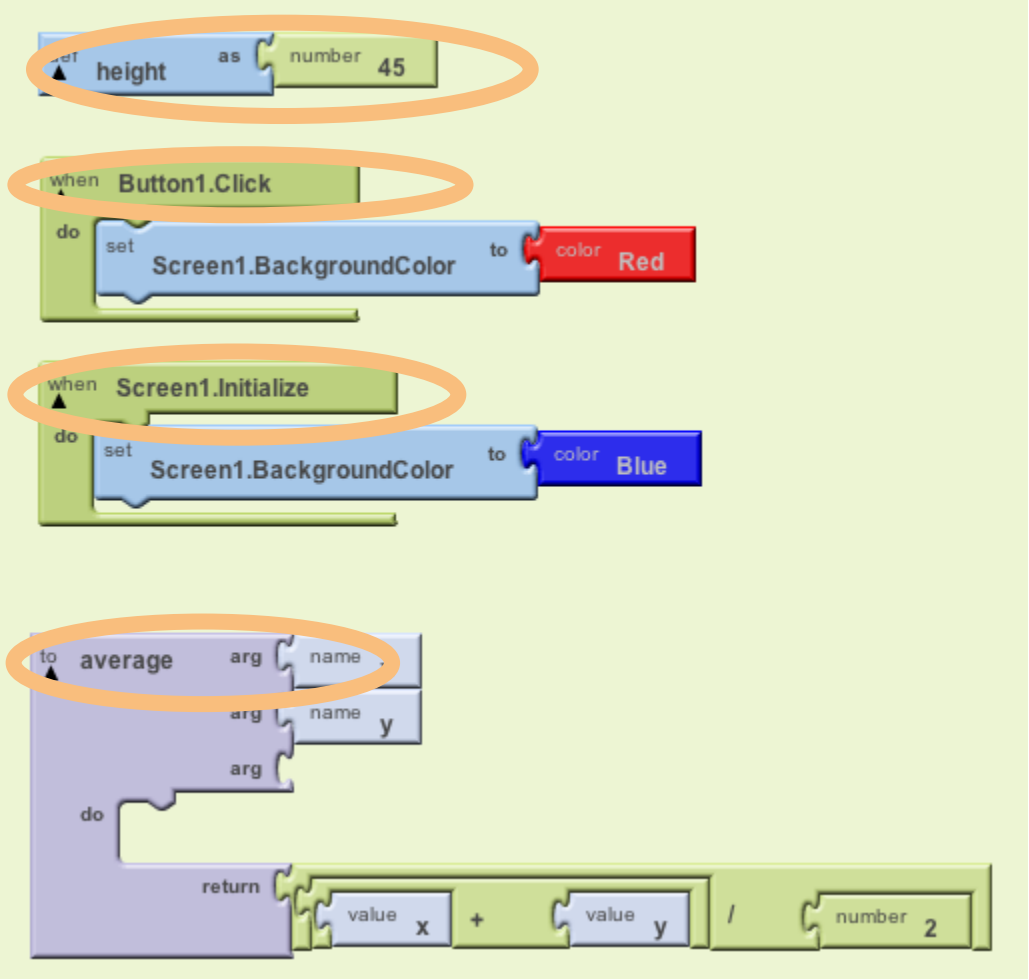
## JAIL JSON App Inventor Language

```
[{genus: componentSetter
  name: "Screen1.BackgroundColor"
  sockets:
       [{genus: color-red,
      name: "color.red",
      sockets: []}]},
{genus: componentSetter
 name: Button1.Height
 sockets:
       [{genus: number-plus
         name: "+"
         sockets: [{genus: number
                           name: 45
                    sockets: []},
                   {genus: componentGetter
                           name: Button1.Height
                           sockets: []}]]}]
```

# Venthon

```
Screen1.BackgroundColor = color.red
Button1.Height = 45 + Button1.Height
```

## A Small Program




Variable Declaration

Event Handlers

Procedure Declaration

# Comments

- Each block could have a comment on it, nestable block comments.
- We decided to mark comments by

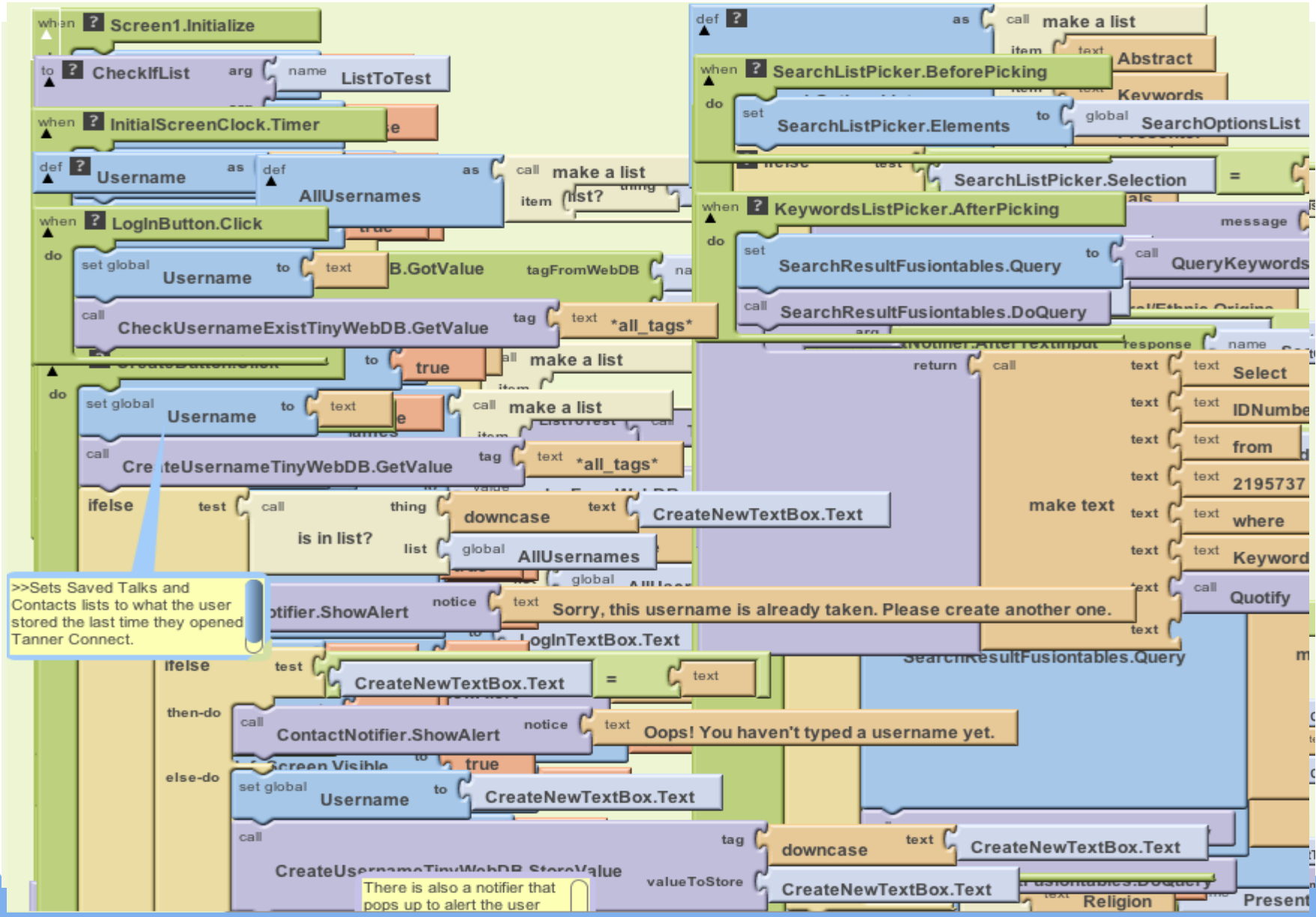
  <| This is a comment. |>
- This could come on the line before a statement block:

  <| This will set the screen to red |>

  Screen1.BackgroundColor = color.red
- Or right after an expression block:

  Button1.Height = (45 + Button1.Height) <| Adding 45 to the current height |>

## Back to Sonali's Program



# Future Steps

- Adding component information
- Going straight to JAIL instead of through the Java Tree Object

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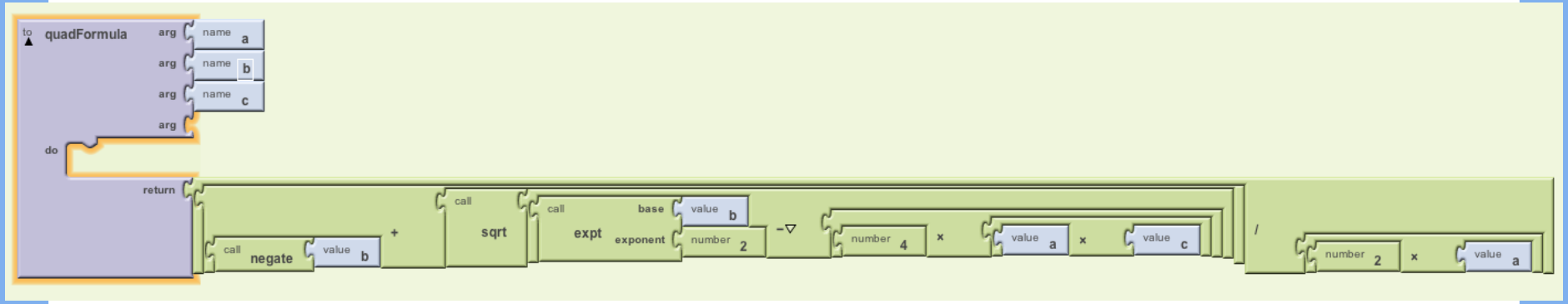
# Text

Blocks

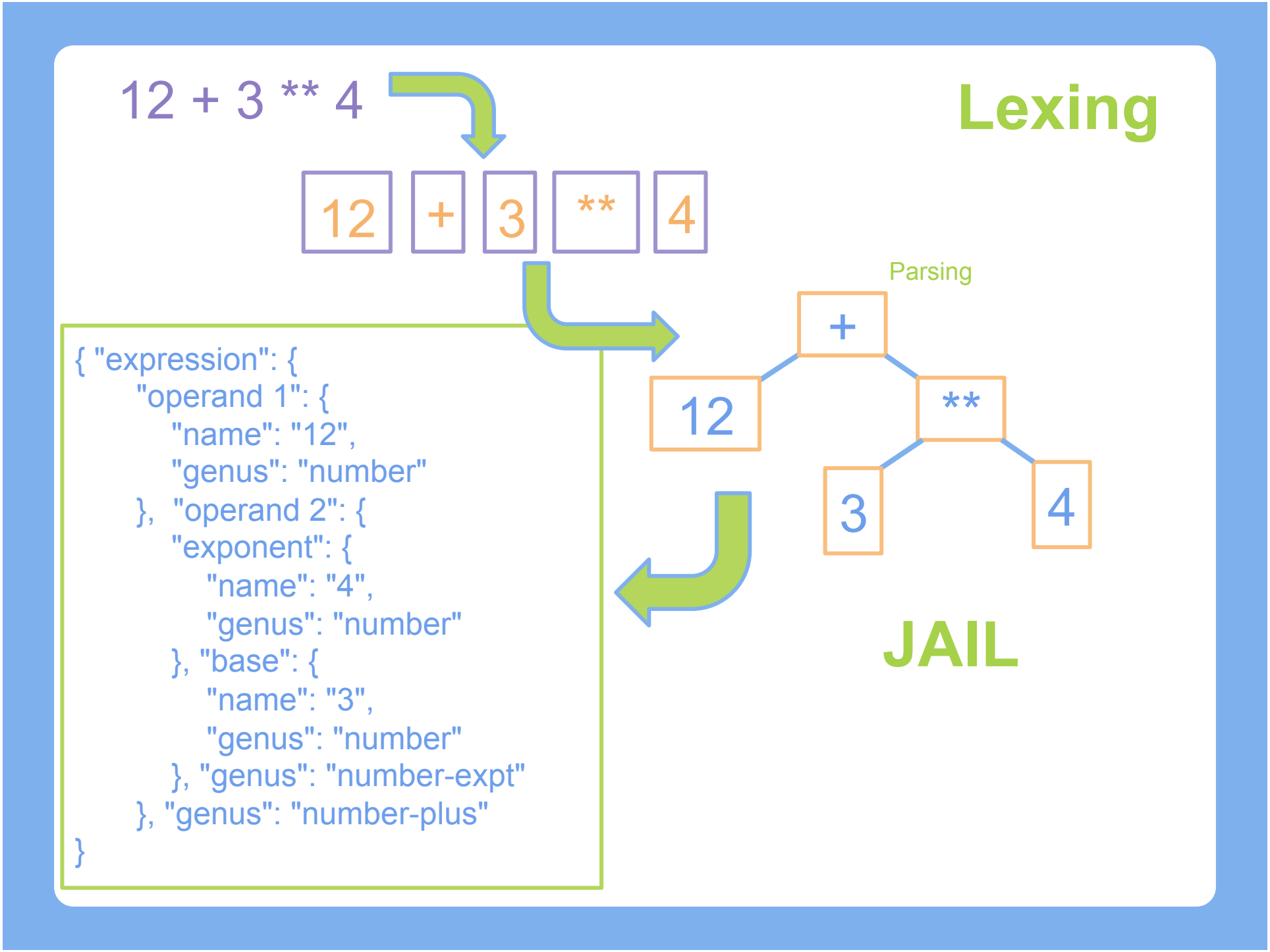
Karishma Chadha

# Here's the situation...




```
fun quadFormula(a, b, c) =
        (-b + sqrt (b ** 2 - 4 * a * c)) / (2*a)
```

# S is for Sharing!


12 + 3 ** 4
Lexing
12
+
3
**
4
Parsing
{ "expression": {
"operand 1": {
"name": "12",
"genus": "number"
}, "operand 2": {
"exponent": {
"name": "4",
"genus": "number"
}, "base": {
"name": "3",
"genus": "number"
}, "genus": "number-expt"
}, "genus": "number-plus"
}
+
12
**
3
4
JAIL

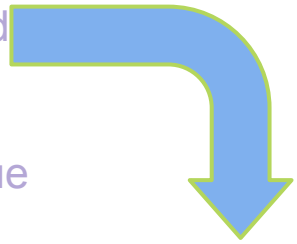
# ANTLR:
## Another Tool for Language Recognition

# Lexing with ANTLR

```
SEMI    : ';' ;

PLUS    : '+' ;

EXPT    : '**' ;

NAME:   ( 'a' .. 'z' | 'A' .. 'Z' | '_')
                ( 'a' .. 'z' | 'A' .. 'Z' | '_' | DIGIT )*
            ;

NUMBER :    ('-')? ( DIGIT* DOT DIGIT+ | DIGIT+ (DOT)?);

fragment
DIGIT : ( '0' .. '9' );
```

```
height = 45

when Button1.Click():
        Screen1.BackgroundColor = color.red

when Screen1.Initialize():
        Screen1.BackgroundColor = color.blue

fun average(x, y)=
        (x+y)/2
```

Lexing: Text to Tokens



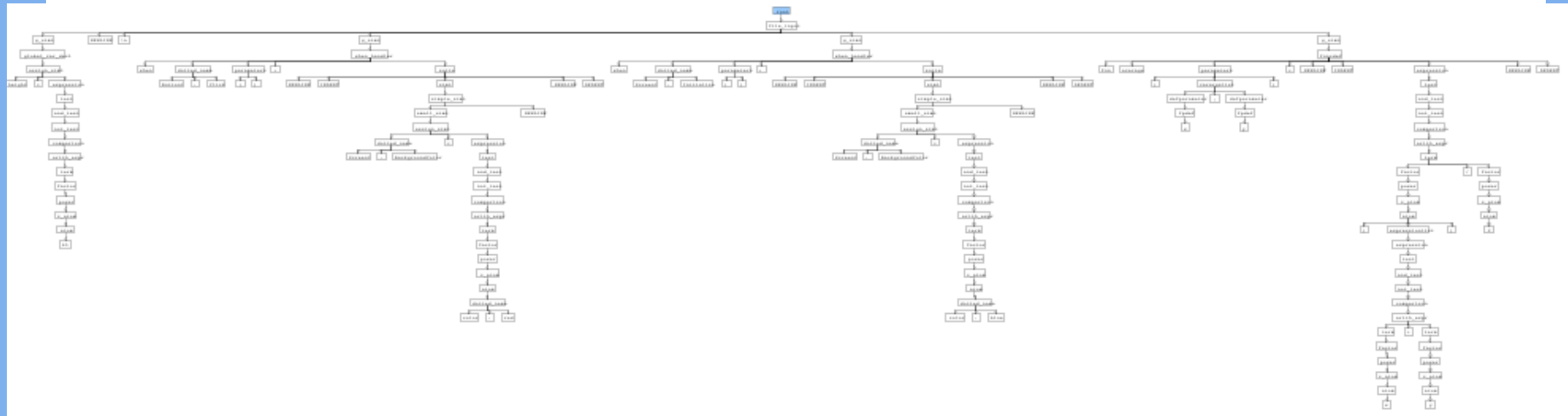
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| height | = | 45 | NEWLINE | when | Button1 | . | Click | ( | ) | |
| : | NEWLINE | INDENT | Screen1 | . | BackgroundColor | = | color | | | |
| . | red | NEWLINE | DEDENT | NEWLINE | when | Screen1 | . | | | |
| Initialize | ( | ) | : | NEWLINE | INDENT | Screen1 | . | | | |
| BackgroundColor | = | color | . | blue | NEWLINE | DEDENT | | | | |
| NEWLINE | fun | average | ( | x | , | y | ) | = | NEWLINE | INDENT |
| ( | x | + | y | ) | / | 2 | NEWLINE | DEDENT | | |

# Parsing with ANTLR

```
when_handler
   :    (INLINE_COMMENT NEWLINE)?
        'when' dotted_name parameters COLON suite
        ;


if_stmt: 'if' test COLON suite
         ('elif' test COLON suite)* ('else' COLON suite)? ;


suite: simple_stmt
       | NEWLINE INDENT (stmt (NEWLINE)*)+ DEDENT;
```

# Parser: Tokens to Trees

height = 45 NEWLINE NEWLINE when Button1 .
Click ( ) : NEWLINE INDENT Screen1 .
BackgroundColor = color . red NEWLINE DEDENT
NEWLINE when Screen1 . Initialize ( ) :
NEWLINE INDENT Screen1 . BackgroundColor =
color . blue NEWLINE DEDENT NEWLINE fun
average ( x , y ) = NEWLINE INDENT ( x +
y ) / 2 NEWLINE DEDENT



# Generating JAIL with ANTLR

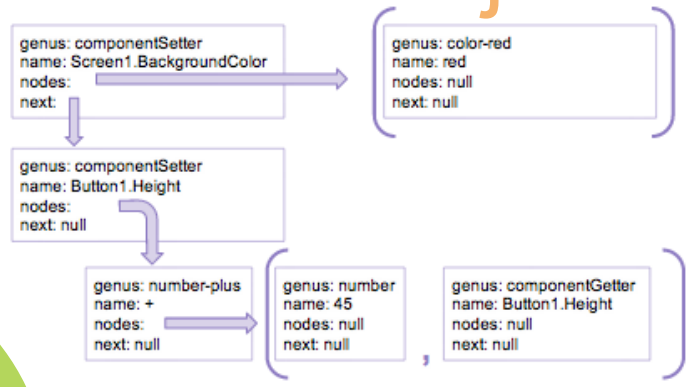
```
when_handler returns [JSONObject object]
@init{
$object = new JSONObject();
}
    :   (INLINE_COMMENT NEWLINE
        {  try {$object.put("comment", $INLINE_COMMENT.text);
           }catch(JSONException e){}
        })?
        'when' dotted_name parameters COLON suite
        {try {

           mergeObjectsString($object, $dotted_name.object);
           $object.put("event", (String) $object.get("property"));
           $object.remove("property");
           $object.put("parameters", $parameters.array);
           $object.put("statements", $suite.array);
           ((JSONArray) obj.get("eventHandlers")).put($object);
         }
         catch (JSONException e){}
        }
        ;
```

# Trees to JAIL

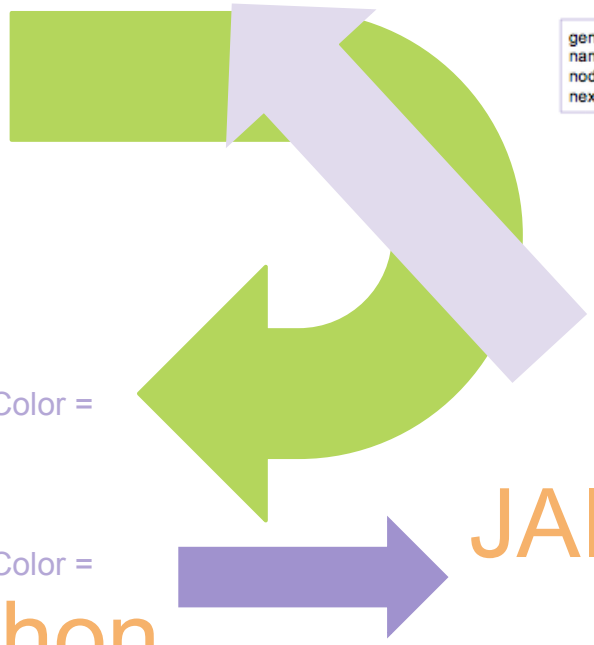

```
{    "globals": [
       {      "expression": {      "name": "45",        "genus": "number" },
              "name": "height",
              "genus": "global_setter"
              }
    ],
    "eventHandlers": [
       {
          "component": "Button1",
          "event": "Click",
          "statements": [ { "expression": { "component": "color", "property": "red" },
                                            "component": "Screen1",
                                            "property": "BackgroundColor",
                                            "genus": "setter"
                                          } ],
          "parameters": []
       },
}
```

# Missing Step

## Java Tree Object




## Blocks



```
height = 45

when Button1.Click():
        Screen1.BackgroundColor =
color.red

when Screen1.Initialize():
        Screen1.BackgroundColor =
color.blue

fun average(x, y)=
        (x+y)/2
```

## Venthon

## JAIL

```
[{genus: componentSetter
 name: "Screen1.BackgroundColor"
 sockets:
                [{genus: color-red
                 name: "color.red"
                 sockets: []}]},
{genus: componentSetter
 name: Button1.Height
sockets:
                [{genus: number-plus
                  name: "+"
                  sockets:
                                [{genus: number
                                  name: 45
                                  sockets: []},
                                 {genus: compon
                                  name: Button1
                                  sockets: []}]}]
```

## For the Future

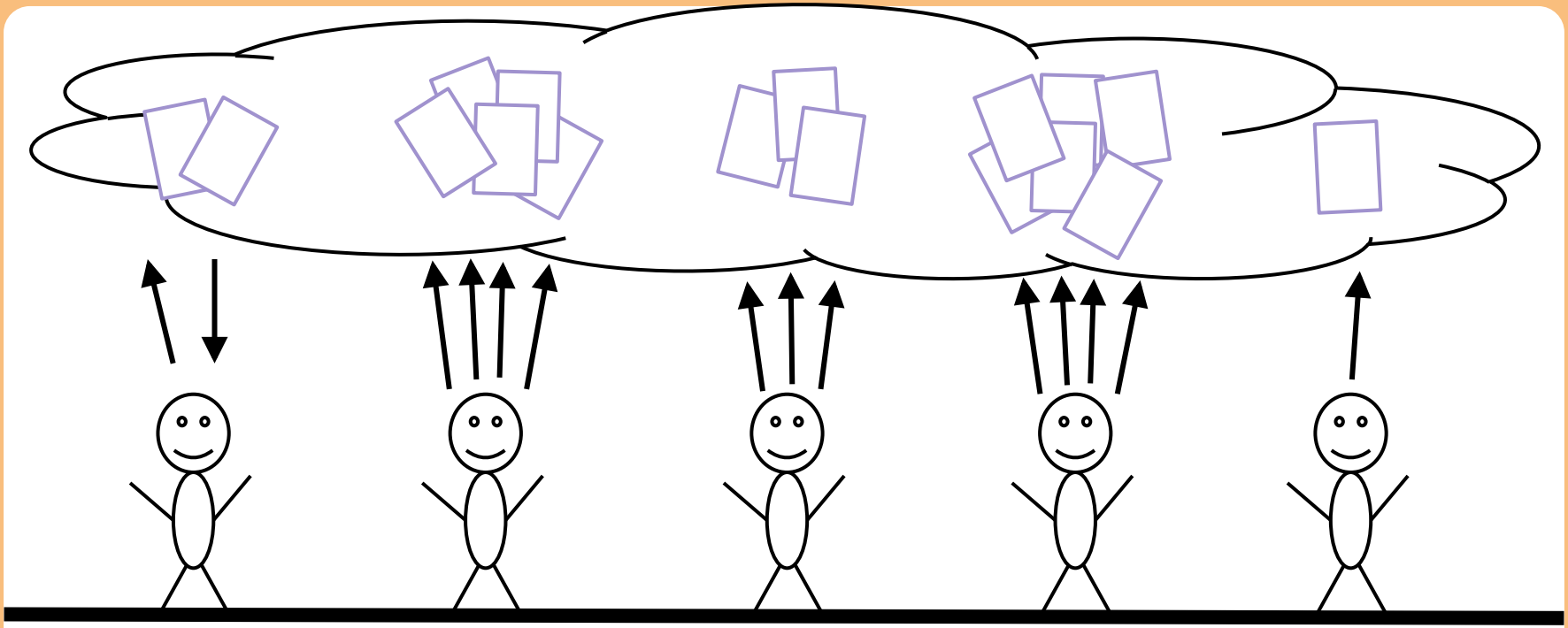
- Converting JAIL to Blocks
- Add another language
  - App Inventor + Java = Venti
- App Inventor is changing
  - We need to adapt to those changes

# Our Presentation

- Introduction to App Inventor
- Posting Pictures (OAuth)- Emily
- Blocks to Text- Erin
- Text to Blocks- Karishma
- Data Mining- Johanna

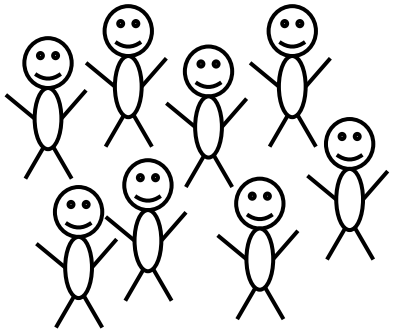
# Data Mining and Visualization

Johanna's project



App Inventor developers

Teachers



Other AI users

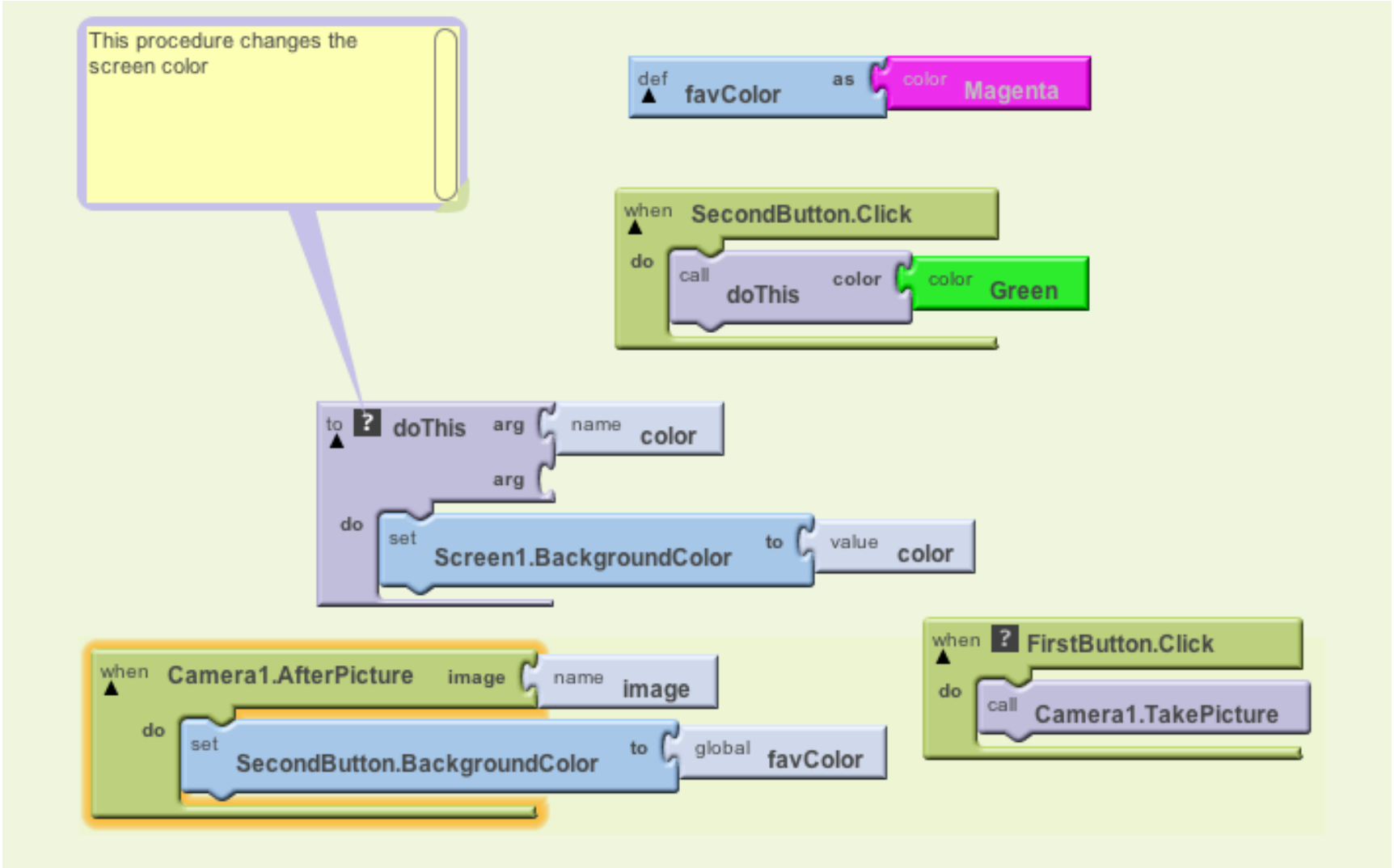
# App Inventor Stats

| Date | Users | Projects | Daily Active | Weekly Active |
|---|---|---|---|---|
| July 26, 2012 | 278389 | 506121 | 4108 | 16662 |
| July 25, 2012 | 276902 | 502892 | 4348 | 16807 |
| July 24, 2012 | 275363 | 499460 | 4235 | 17042 |
| July 23, 2012 | 273656 | 496050 | 3716 | 17003 |
| July 22, 2012 | 272138 | 493128 | 2676 | 16837 |
| July 21, 2012 | 271061 | 491126 | 3081 | 16858 |
| July 20, 2012 | 269959 | 489080 | 4222 | 17177 |
| July 19, 2012 | 268620 | 485791 | 4465 | 17473 |
| July 18, 2012 | 267067 | 481927 | 4729 | 17571 |
| July 17, 2012 | 265294 | 477849 | 4447 | 17512 |

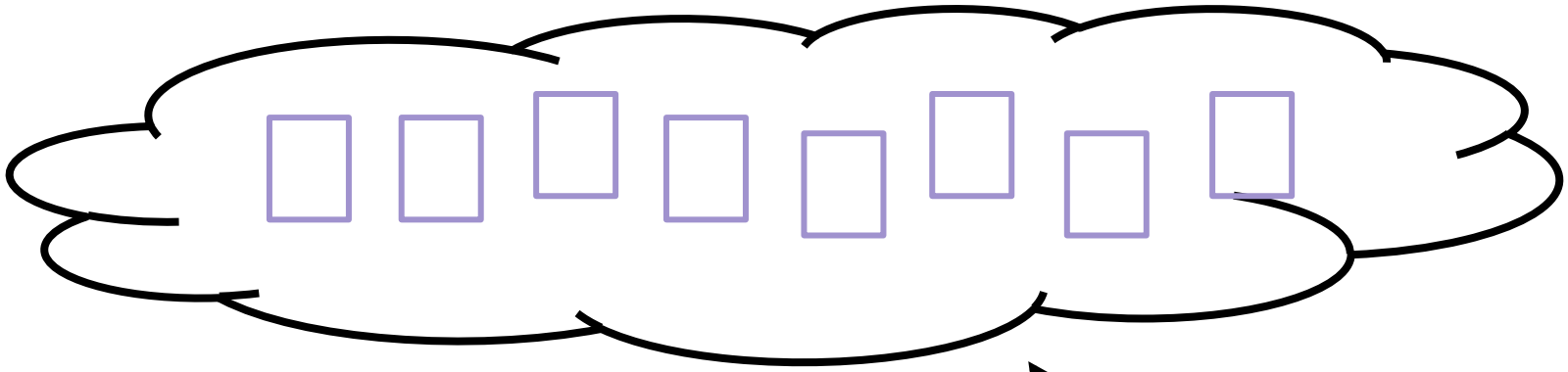
Jeff Schiller

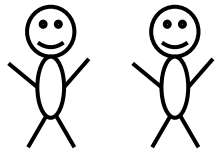
# Information to gather

link



# Application: app-inventor-stats





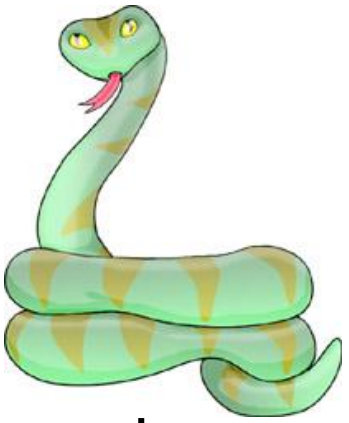
Version 1:
App Inventor

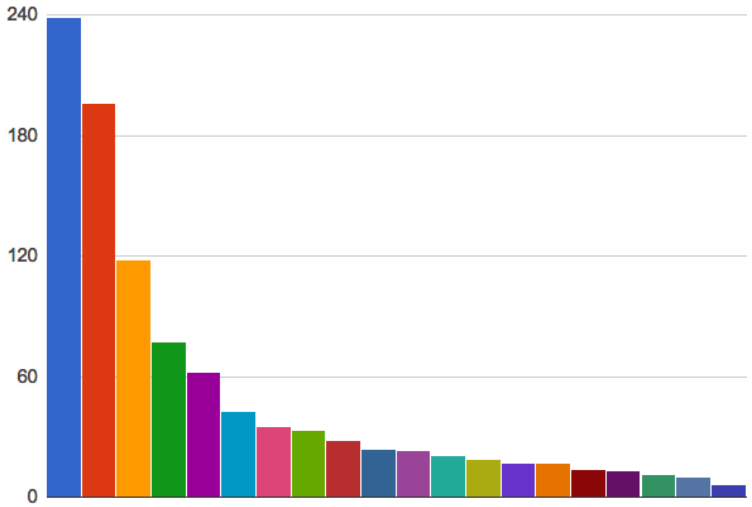
Version 2:
Data collecting files

cs.wellesley.edu

Multiple versions of an application
running simultaneously share a datastore

Gql query






django

# The future

- Process all App Inventor files
- Allow everyone to view stats
- Instrument App Inventor so we can track the trajectory of each project
- Allow teachers to track students' progress
- Collect demographic data
- Privacy issues

# Special Thanks


- Provost's Office - Faculty Research Fund for Science & Math (IBM)

Brachman Hoffman Fund Faculty Small Grants Summer Research Awards

for providing funding for these projects

- Lyn Turbak for supervising


Stay tuned to www.tinkerblocks.org for updates on our projects!

# Questions?