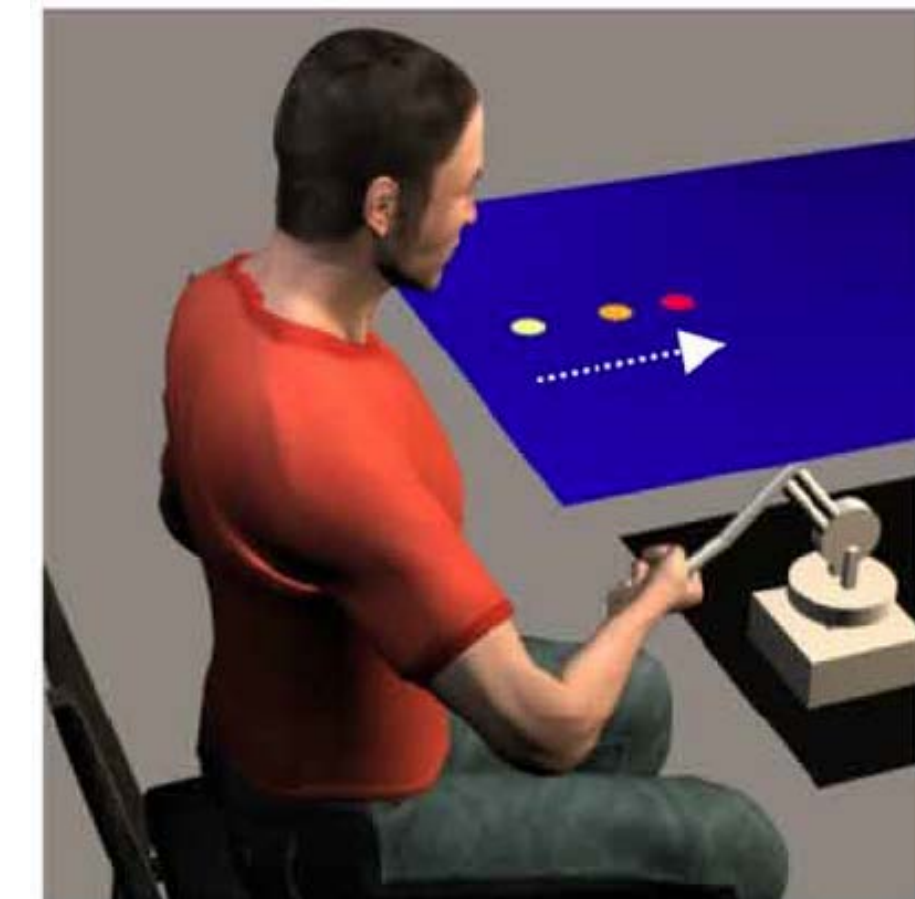


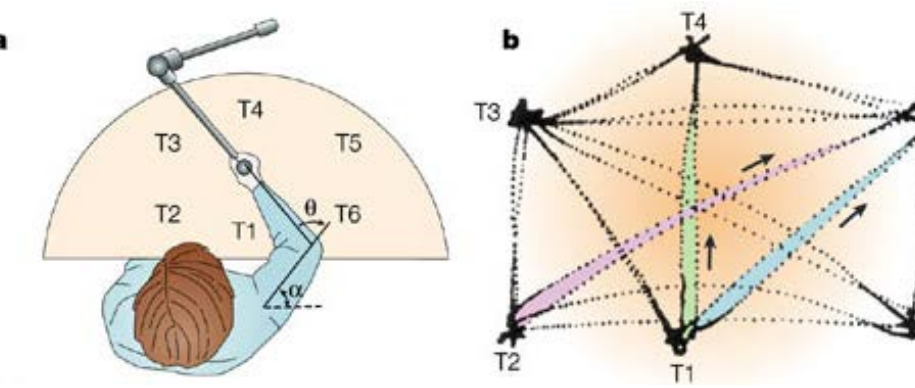
Introduction

- Point-to-point reaching is a commonly used paradigm in the field of human motor control.
- Many experimental methods that are designed to study reaching are not portable, which makes it difficult for researchers to study populations with limited mobility or motor dysfunction.



Purpose

To develop a point-to-point reaching system that can capture key movement variables (e.g. speed and accuracy), yet is also portable and inexpensive.

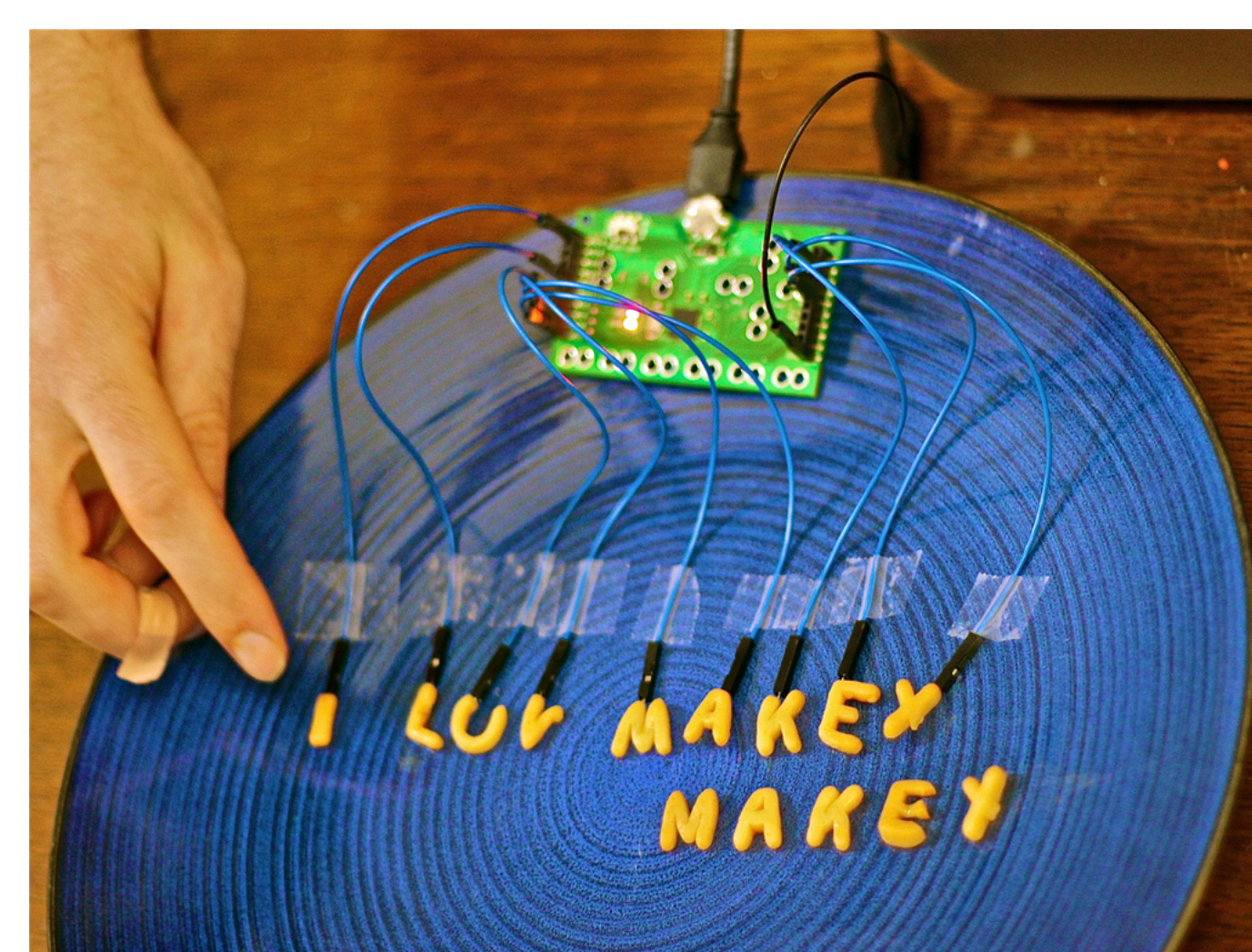
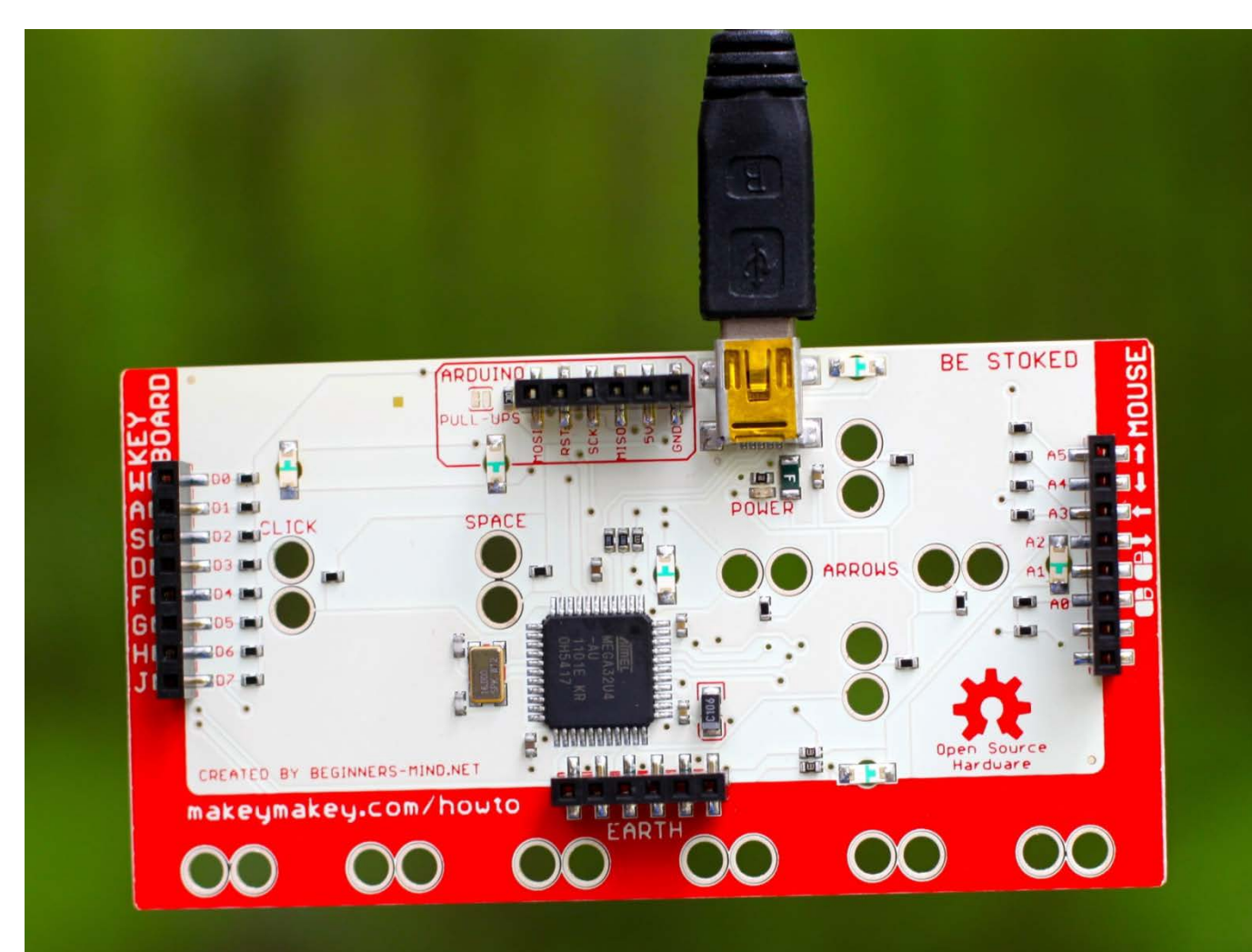
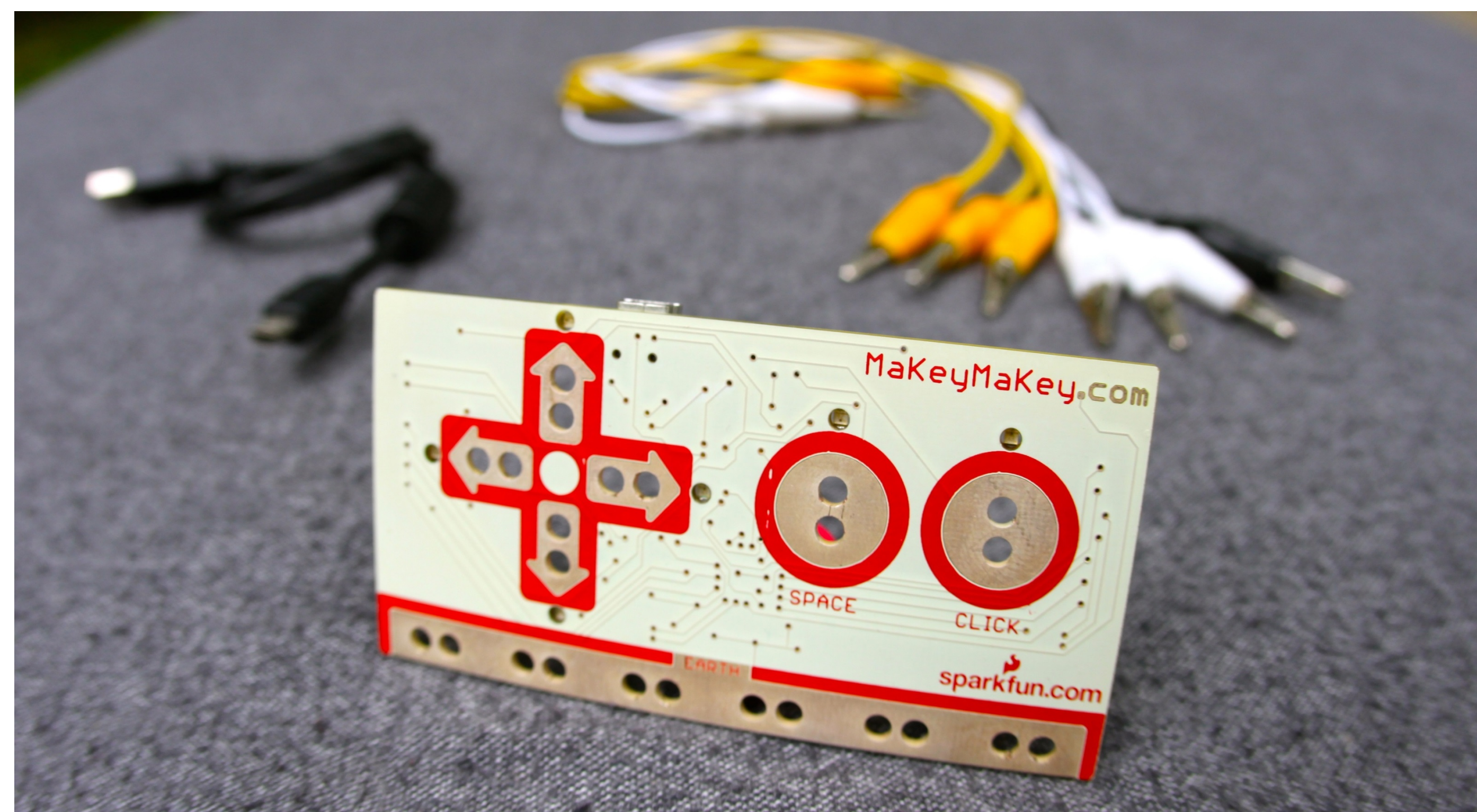


Side and top view of a typical point-to-point reaching experimental setup (Mawase & Karniel 2012; Scott 2004).

Methods

MaKey MaKey

- Arduino-based, single-board microcontroller
- Inexpensive (\$49.99)
- Small and portable
- Easy to program
- Simple USB connection, Mac and PC compatible
- Currently used by USU researchers

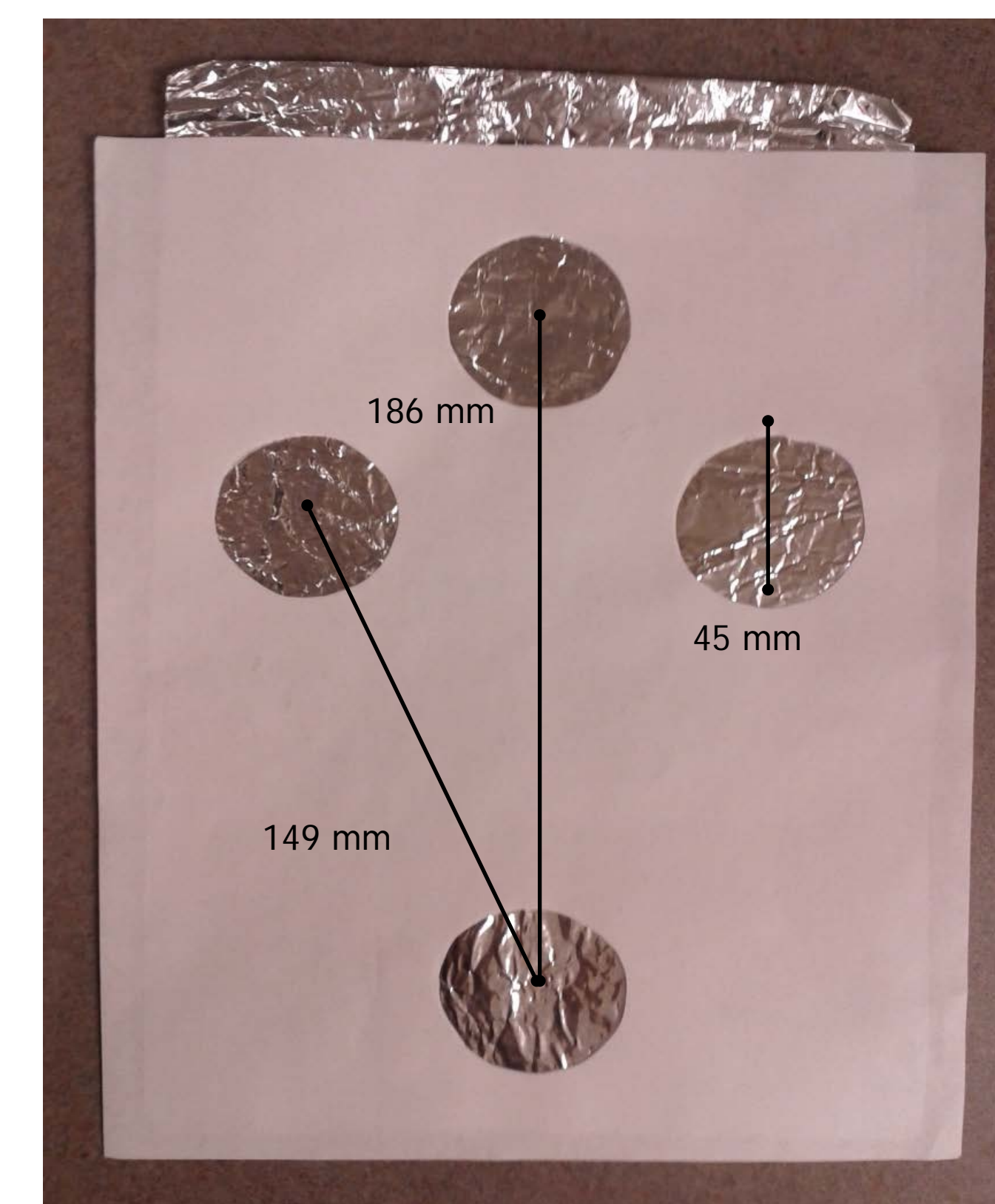
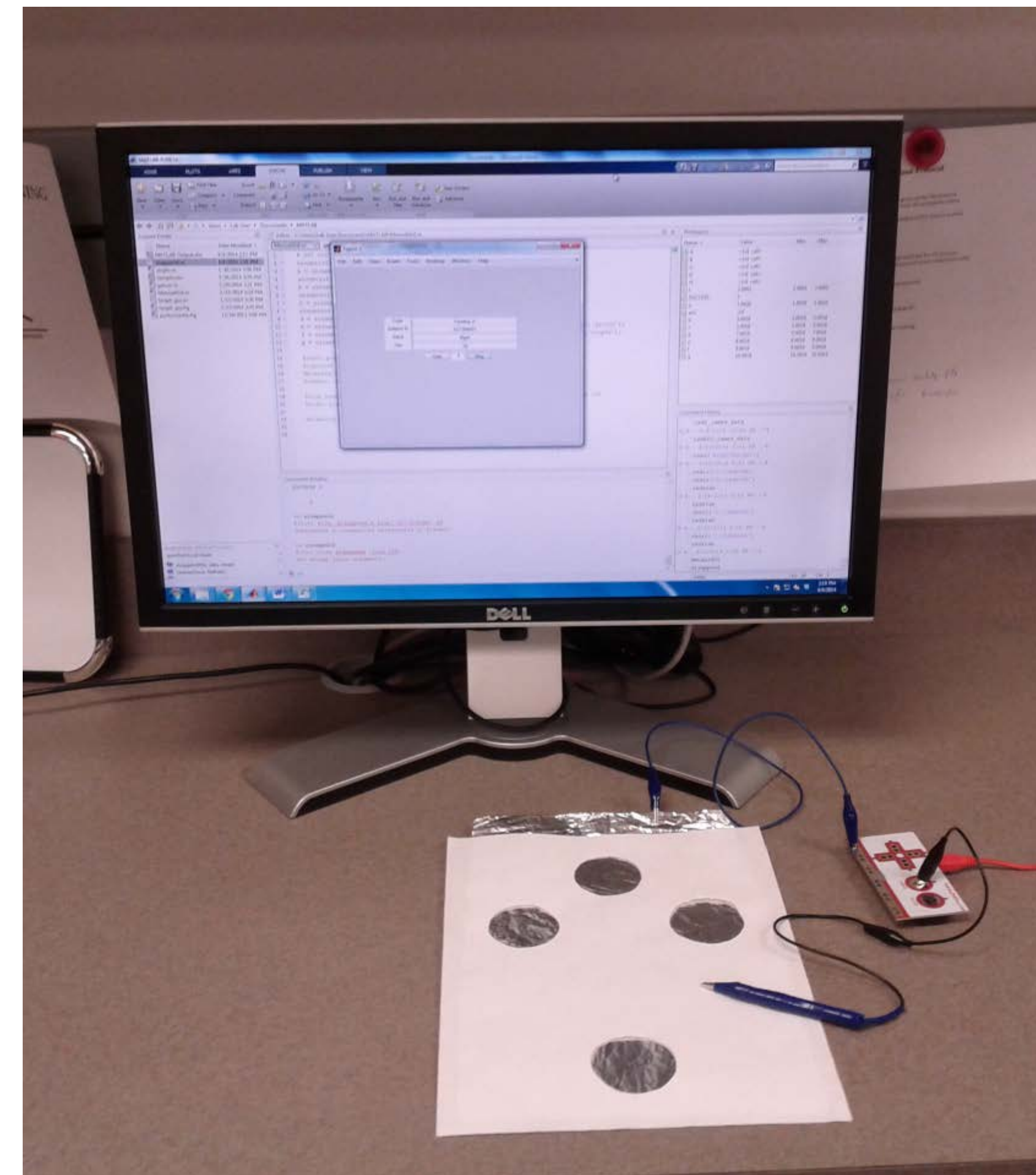


All pictures extracted from MaKey MaKey Press Release.

Hardware



- Participants will reach to and from targets with a modified alligator clip stylus.
- Each time the stylus hits an aluminum foil target a circuit is completed with the attached MaKey MaKey.



Software

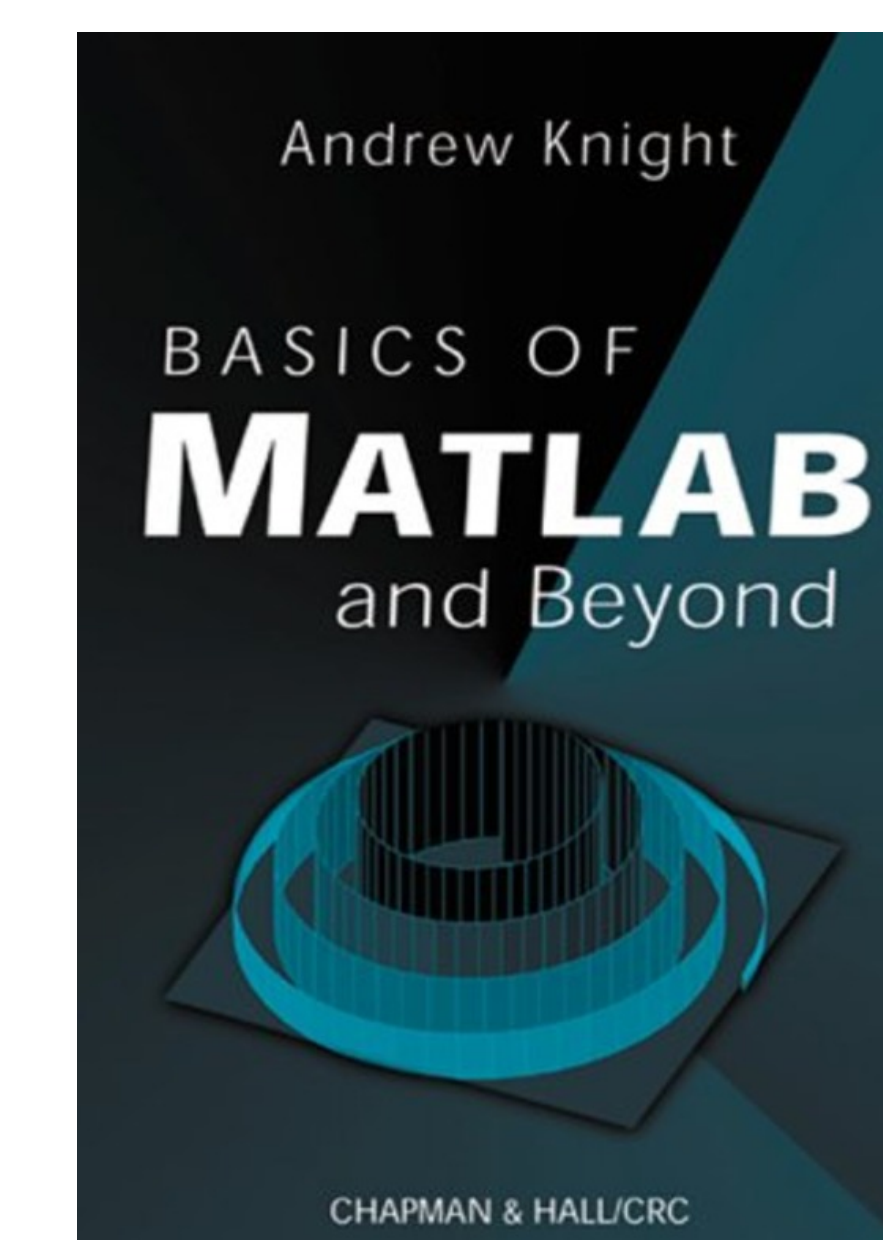
```

359 %-----
360 function range = calcrange(range,m,n,offset)
361 % Calculate full target range, in Excel AI notation, to include array of size
362 % m x n
363
364 range = upper(range);
365 %cols = isletter(range);
366 rows = -cols;
367 % Construct first row.
368 if ~any(rows)
369     firstrow = offset+1; % Default row.
370 else
371     firstrow = str2double(range(rows)); % from range input.
372 end
373 % Construct first column.
374 if ~any(cols)
375     firstcol = 'A'; % Default column.
376 else
377     firstcol = range(cols); % from range input.
378 end
379 % try
380 lastrow = num2str(firstrow+m-1); % Construct last row as a string.
381 firstrow = num2str(firstrow); % Convert first row to string image.
382 lastcol = dec2base27(base27dec(firstcol)+n-1); % Construct last column.
383
384 range = [firstcol firstrow ':' lastcol lastrow]; % Final range string.
    
```

a) An example of code showing how the user-entered data and timestamps are exported into the next empty row in the Microsoft Excel log.

Type	Feeding A
Subject ID	A01380691
Hand	Right
Day	2d
<input type="button" value="Start"/> <input type="button" value="0"/> <input type="button" value="Stop"/>	

c) User-editable graphical user interface (GUI).



b) The book I used to learn MATLAB!

```

>> xlsappend
Error: File: xlsappend.m Line: 377 Column: 26
Unbalanced or unexpected parenthesis or bracket.

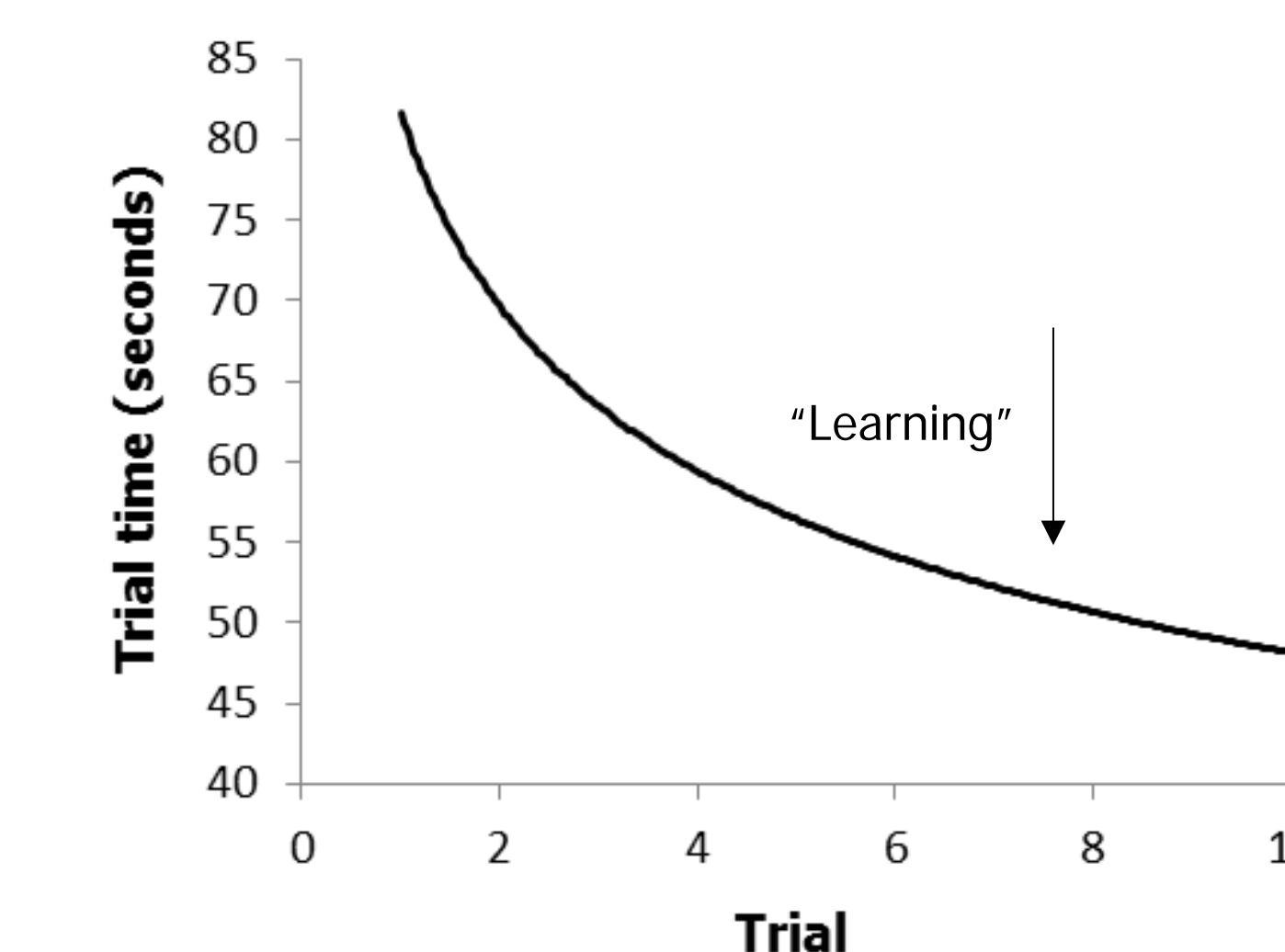
>> xlsappend
Error using xlsappend (line 139)
Not enough input arguments.
    
```

d) Two common error messages seen while programming.

Data Logging and Analysis

1	Timestamp	Target or Feeding	User ID	Day	L/R Hand	Trial Time
2	4/4/2014 14:11	Feeding A	A01380691	1	Left	4.881525595
3	4/4/2014 14:13	Feeding A	A01380691	1a	Left	5.504850299
4	4/4/2014 14:13	Feeding A	A01380691	1b	Left	2.904047273
5	4/4/2014 14:13	Feeding A	A01380691	1c	Left	2.520110098
6	4/4/2014 14:13	Feeding A	A01380691	2	Right	2.184115796
7	4/4/2014 14:13	Feeding A	A01380691	2a	Right	0.919770564
8	4/4/2014 14:14	Feeding A	A01380691	2b	Right	2.780774346
9	4/4/2014 14:14	Feeding A	A01380691	2c	Right	2.512007853
10	4/4/2014 14:14	Feeding A	A01380691	2d	Right	2.000085846
11						
12						

Sample output.



Hypothetical point-to-point reaching data.

Trial data logging

- Participants must correctly hit each target 15 times for trial to be complete.
- Data collected in MATLAB, then exported to a continuously updating Microsoft Excel file.

Importance of timestamp

- It records how quickly the participant is moving.
- It infers how accurately the participant hits the targets.
- It reflects the process of motor learning (see left).

Discussion

- We have made progress in creating a portable, user-friendly and low-cost system for potential use in motor control research.
- Changing the size, number and/or distance between targets allows the experimenter to adjust the task's difficulty without modifying the data acquisition code.

Our next step is to pilot this system in a motor learning study in which participants repetitively reach from point to point as training.



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HPER health, physical education & recreation

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