



# *Relevo*

## The Pin Actuated Display System

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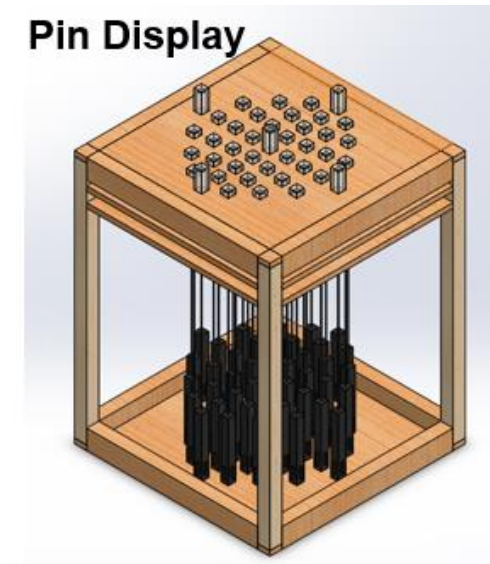


# Introduction to *Relevo*

- Problem: modern displays are based on visual systems, this prohibits the visually impaired from using them. The only options the visually impaired currently have is Braille (words only) and having the object available for direct contact which is not always possible.
- Solution: *Relevo* integrates touch into the visual display system to enable the visually impaired while also adding another dimension to the visual experience
- “Braille for images”

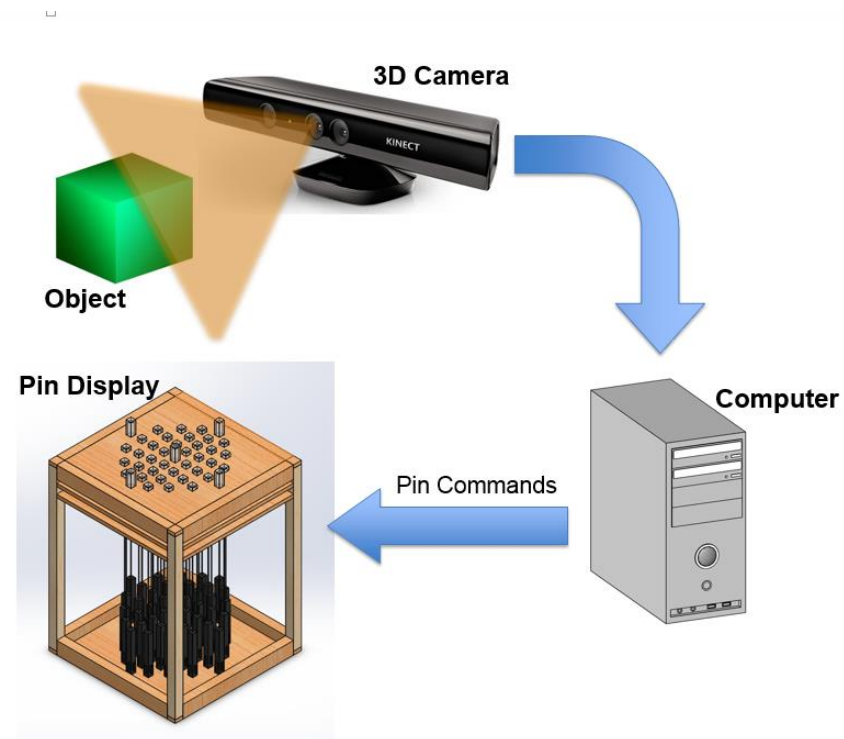


VS



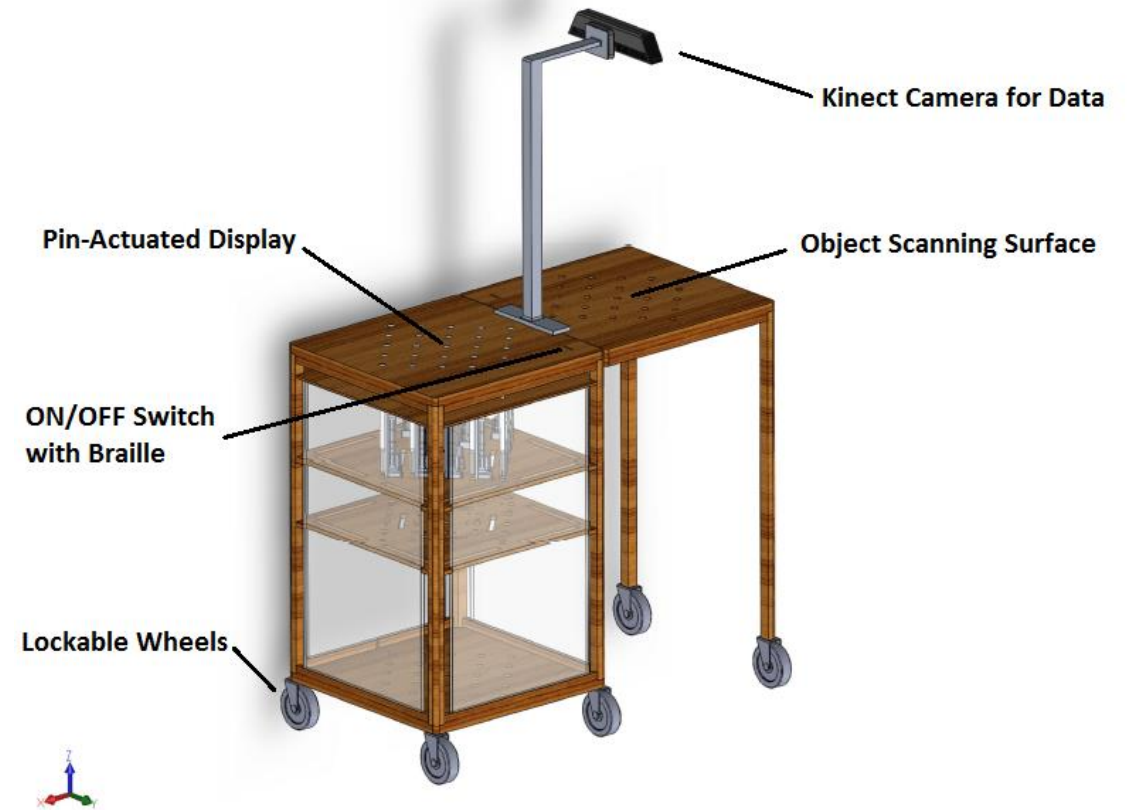
# Brief Description of *Relevo*

- *Relevo* is designed to revolutionize the way we see displays by integrating touch and visual media by the use of pins to produce 3D images
- Using a 3D camera, *Relevo* takes in physical data (depth only currently) and converts it to a 3D image on the pin display table



# Market Product Physical Appearance

- Bottom shelf for power supply and embedded computer
- Middle shelf for microcontroller and wiring
- Top shelf for pins and potentiometers
- Top surface for pin display and object scanning

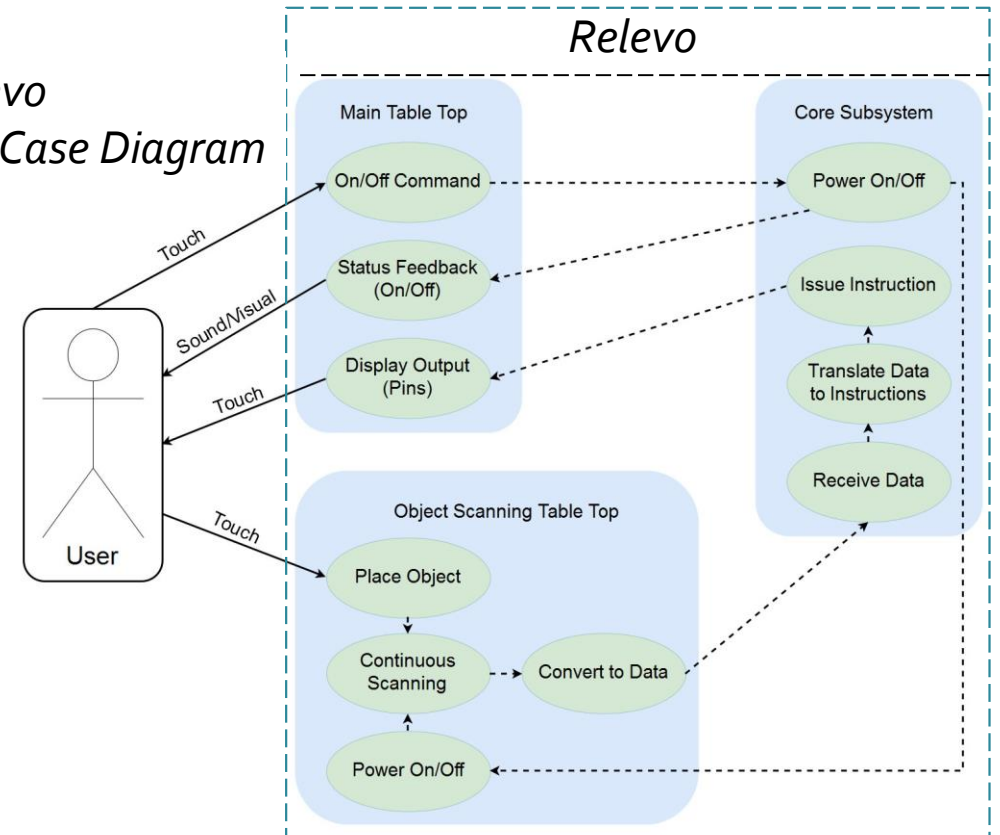


Final market design of *Relevo* with parts labelled

# User System Overview

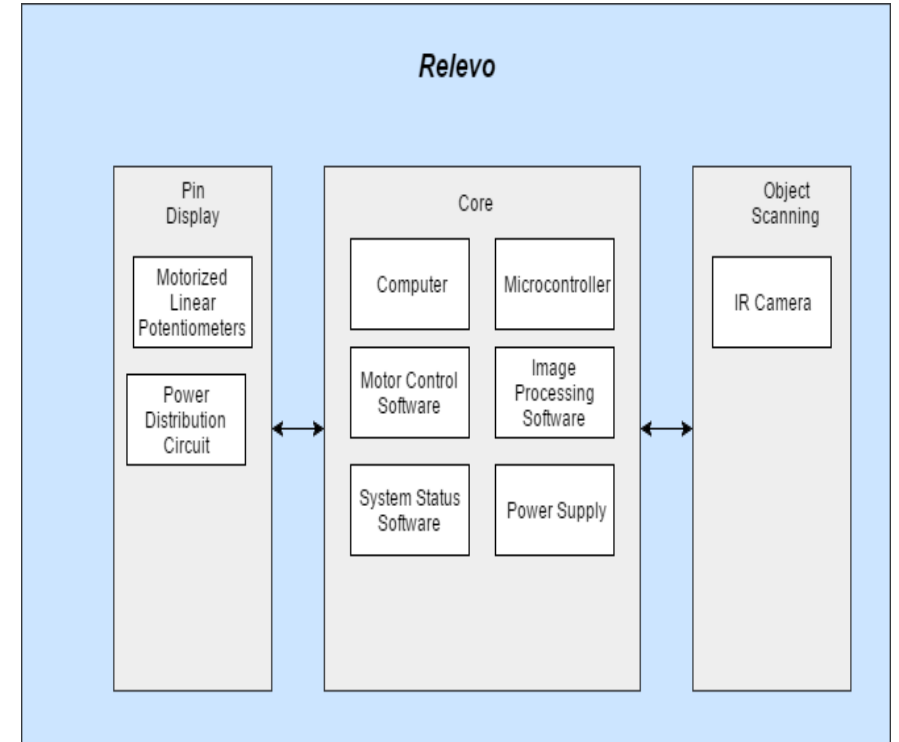
- Single, integrated power switch
- User places object, automatically scanned
- Pin display shows object physically, user can feel the shape
- Feedback to user:
  - Sound upon boot up or shutdown (for the visually impaired)
  - LED power indicator
  - If object scanned pins will move
- Signage:
  - Warnings in written English and Braille
  - Instruction in written English (Adding Braille is possible after user testing)

*Relevo Use Case Diagram*

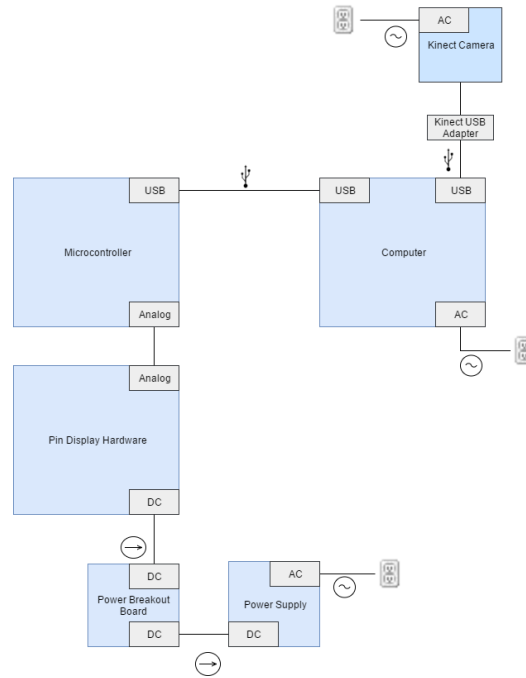


# Overall Architecture

- 3 Main Systems:
  - Pin Display: controls the pin display
  - Core: processes depth data, converts to instructions the microcontroller can use, issues commands to pins, supplies power to the system
  - Object Scanning: scans user object, draws power from Core



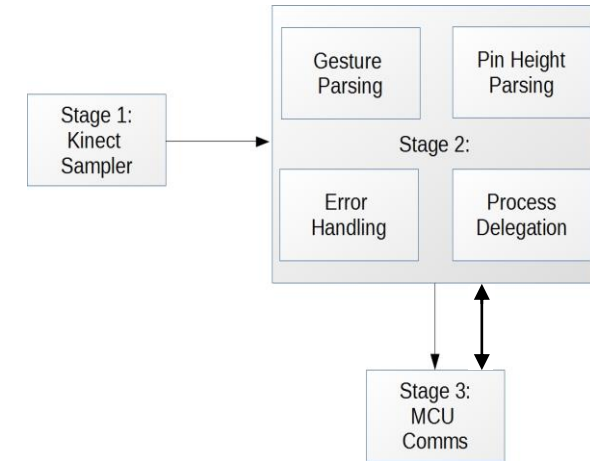
# Software/ Hardware Systems



Hardware Electrical Diagram

- Hardware:
  - Power Supply Subsystem
  - Data Acquisition Subsystem
  - Main Subsystem (Embedded computer)
  - Pin Display Subsystem

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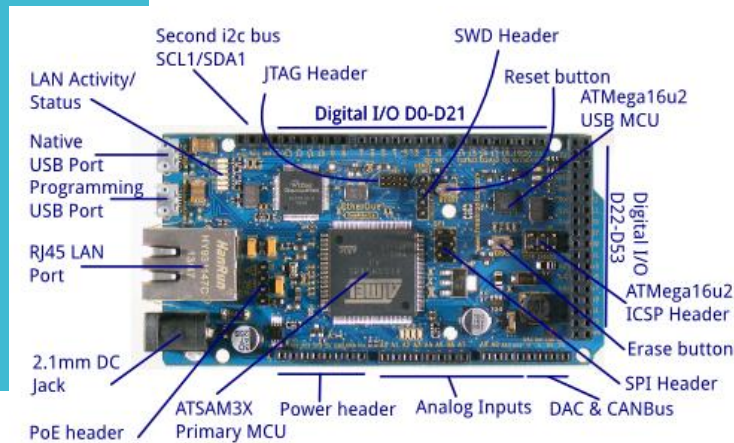


Simplified Software Diagram

- Software:
  - Data Acquisition
  - Data Processing
  - Microcontroller Communication

# Proof of Concept Components

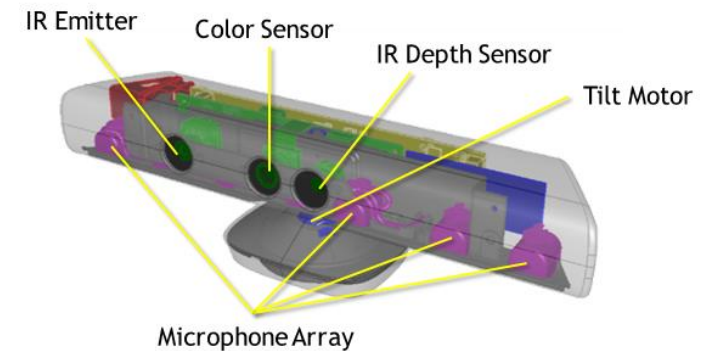
- (4x) ALPS 10KA/10KB Dual Tack Motor Fader Potentiometer
- (4x) 3D Printed Pin
- (2x) SN754410 H-Bridge
- (1x) Arduino Due
- (1x) Microsoft Kinect Camera
- (1x) ASUS Laptop
- (1x) Thermaltake TR1 TR-600 600W ATX12V v2.3 Power Supply
- (1x) Buck Converter (12V to 9V)



Arduino Due Microcontroller



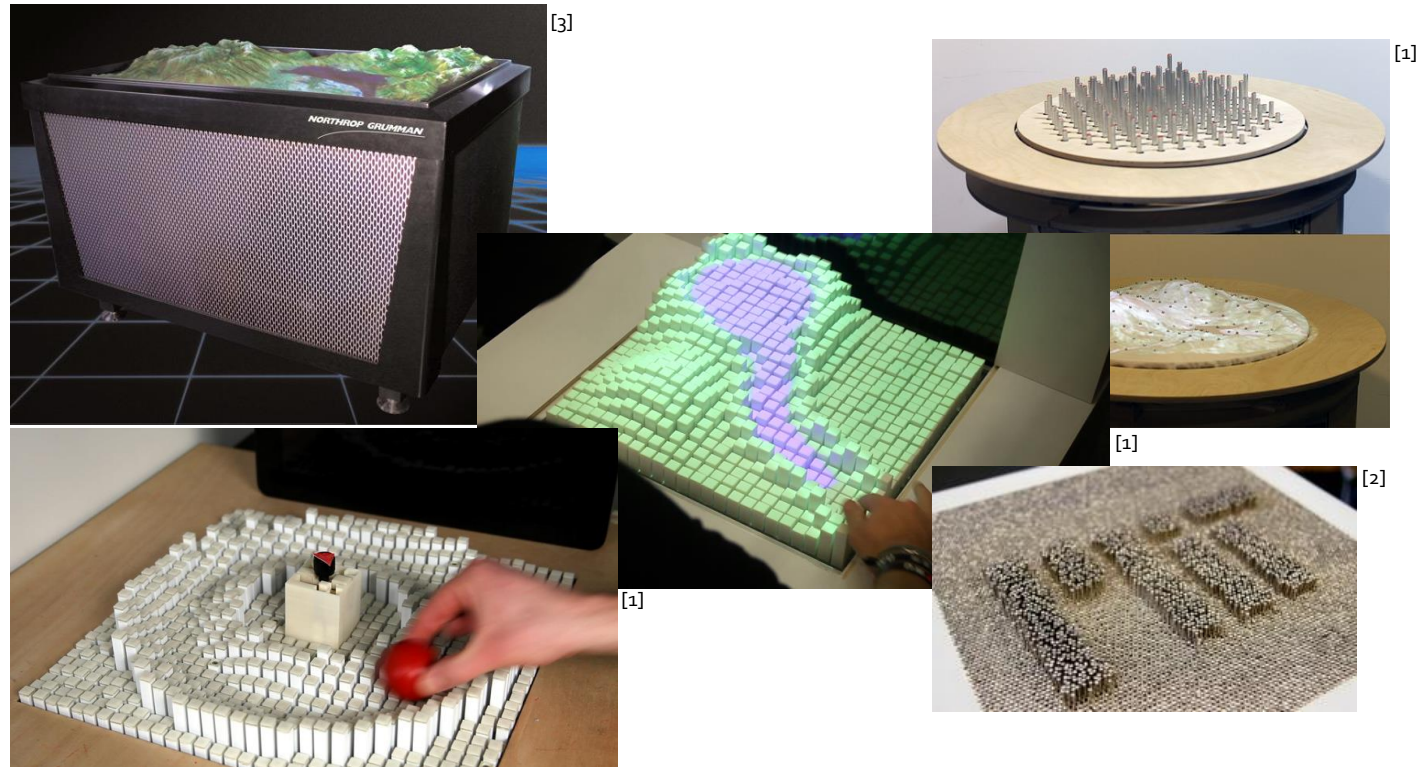
Potentiometer and Pin



Kinect Camera



# Future Potential



- The images above show various ways that *Relevo* could be further developed given more time and budget
- Potential Upgrades: increased resolution, higher pin count, take in colour data
- Possible Future Applications: topographic display with image overlay via projector, long-distance object rendering for the visually impaired (i.e. - shopping)

# Conclusion

- *Relevo* adds a new dimension to the display market via a touch-based user interface to enable the visually impaired and enhance the visual user experience
- Next 4 months will focus on creating the market product (25+ pins, embedded CPU, fully integrated system, market ready chassis)
- Ideally with more time and increased budget the resolution and pin count would increase



Final Design of *Relevo*: asymmetrical view, side view, and top view

# References

- “Tangible Media Group,” *Tangible Media Group*. [Online]. Available: <http://tangible.media.mit.edu/>. [Accessed: 04-Apr-2017].
- “Digitally Reconfigurable Mold,” *engineering*. [Online]. Available: <http://www.bnnpeters.com/digitally-reconfigurable-mold.html>. [Accessed: 04-Apr-2017].
- “Terrain, Touch and Symbolic Tables,” *Media Lab*. [Online]. Available: <http://blogs.walkerart.org/newmedia/2006/05/16/art-com-northrop-grumman-and-audiopad/>. [Accessed: 04-Apr-2017].