**YouTwo**

**IoT Capstone Idea Submission**

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GitHub: [IvanBoyd/IoT\_Capstone-IvanBoyd: Keystone Project Fall, 2021, CNM/FUSE/IoT Bootcamp (github.com)](https://github.com/IvanBoyd/IoT_Capstone-IvanBoyd)

**Brief:** My idea is to significantly expand, modify and refine the infinity mirrored-box which was my midterm project. The prime addition will be to provide a venue for individuals to bilocate or present a personal doppelgänger inside the infinity box.

My midterm was a simple prototype that received both touch and movement input which it converted into varying light values and strobe effects on NeoPixels. It did not take advantage of NeoPixel’s ability to produce a wide range of differing colors nor were the NeoPixels composed artistically throughout the infinity box. The enclosure itself was made from foam core and completely lacked attributes of finish, such as the storage for components, the concealment of wiring and overall look and feel. This was a good starting point, but a revised version will have to address all these issues.

The capstone version of the infinity box involves a complete overhaul of the electronic components adding Adafruit DotStar Pixels in a 16x16 grid with 256 addressable pixels, a Garmin LIDAR Optical Distance LED Sensor, and possibly including 100 NeoPixel Fairy Lights and a DotStar High Density 8x8 – 64 RGB LED pixel matrix and replacing the Teensy with a Particle Argon processor. These seemingly similar components all require their own libraries and programming differences. The display goals of each are radically different and the programming involved is not interchangeable.

Features:

* Infinity box that houses five acrylic mirrors and one two-way glass mirror to be enclosed in polished black acrylic with cut-outs for circuit boards, user adjustable features and power.
* The ability to receive images, such as selfies, from any Bluetooth device and project them in low resolution into the Infinity Box, creating a doppelgänger that will be recursively echoed until it fades from view. I haven’t decided if the infinity box will be sending anything back to the sending Bluetooth device, though I think there are intriguing possibilities here.
* The infinity box will be aware on two levels of movement in its general vicinity. First, any general movement that can be detected with broad detection sensors and secondly with highly directional movement approaching and receding from the infinity box. General movement will result in an apparent awakening of the infinity box, perhaps indicated by soft LED lights turning on or mildly pulsing. Movement directly in front of the infinity box will produce correlative light activity within the infinity box.
* Random lighting effects that occur when presence has been identified. I would like this to involve an exploration of the visual capabilities of Dot and Neo Pixels including color perception when a single Dot/Neo pixel pulses in different colors and how the color of neighboring Dot/Neo pixels affects and/or follows traditional color theory schemes like complementary and analogous.
* A thermo-sensor that responds to touch induced temperature changes by a different patterning of LED lights.
* OLED display that provide feedback on certain operational characteristics of the infinity box.
* Required parts list
* Standard breadboard, 22 g wires
* Particle Argon processor
* Adafruit NeoPixel LED Fairy Lights, 100 wired
* Adafruit DotStar high density 8x8 Grid – 64 RGB LED Pixel Matrix
* Adafruit DotStar Matrix 16x16 – 256 RGB LED Pixels
* Garmin Lidar v4 LED Ranging Module
* LED Encoder
* Adafruit SSD1306 OLED Display
* Adafruit BME 280 Temperature/Pressure/Humidity Sensor
* Five acrylic mirrors, one glass two-way mirror, black plexiglass

Documentation:

* Lidar code working: YouTwo-V4LED\_I2C\_Lidar.ino
  + Provides distance in millimeters in time increments set with delay() function, for now.

Research:

Garmin Lidar Distance Sensor

Accessed 11/29/21, [Getting started with the Garmin (Qwiic) LIDAR-Lite v4 LED | Into Robotics](https://www.intorobotics.com/lidar-lite-v4-led-arduino/)

Includes code examples for hooking up

LED Color Theory

Accessed 11/29/21, [What Are the Rules to Using Color in Stage Lighting? – Learn Stage Lighting .com](https://www.learnstagelighting.com/how-do-i-use-color-effectively/#:~:text=The%20first%20method%20of%20coloring%20light%20is%20the,lights%20in%20order%20to%20mix%20the%20desired%20color.)

HTML Colors:

Accessed 12/2/21, [Html Colors](https://htmlcolors.com/)

Doppelgänger references:

Accessed 11/29/2021: [Doppelgänger - Wikipedia](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger)

A **doppelgänger** ([/ˈdɒpəlɡɛŋər, -ɡæŋər/](https://en.wikipedia.org/wiki/Help:IPA/English); German: [[ˈdɔpl̩ˌɡɛŋɐ]](https://en.wikipedia.org/wiki/Help:IPA/Standard_German) ([About this sound](https://en.wikipedia.org/wiki/File:De-doppelgaenger.ogg)[listen](https://upload.wikimedia.org/wikipedia/commons/f/fc/De-doppelgaenger.ogg)), literally "double-walker") or **doppelganger** is a biologically unrelated [look-alike](https://en.wikipedia.org/wiki/Look-alike), or a double, of a living person.

In fiction and mythology, a doppelgänger is often portrayed as a ghostly or [paranormal](https://en.wikipedia.org/wiki/Paranormal) phenomenon and usually seen as a [harbinger](https://en.wiktionary.org/wiki/harbinger) of bad luck. Other traditions and stories equate a doppelgänger with an [evil twin](https://en.wikipedia.org/wiki/Evil_twin). In modern times, the term **twin stranger** is occasionally used.[[1]](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger#cite_note-1) The word "doppelgänger" is often used in a more general and neutral sense, and in slang, to describe any person who physically resembles another person.

Mythology[[edit](https://en.wikipedia.org/w/index.php?title=Doppelg%C3%A4nger&action=edit&section=2)]

English-speakers have only recently applied this German word to a paranormal concept. [Francis Grose](https://en.wikipedia.org/wiki/Francis_Grose)'s, *Provincial Glossary* of 1787 used the term [*fetch*](https://en.wikipedia.org/wiki/Fetch_(folklore)) instead, defined as the "apparition of a person living." [Catherine Crowe](https://en.wikipedia.org/wiki/Catherine_Crowe)'s book on paranormal phenomena, *The Night-Side of Nature* (1848) helped make the German word well-known. However, the concept of [alter egos](https://en.wikipedia.org/wiki/Alter_ego) and double spirits has appeared in the folklore, myths, religious concepts, and traditions of many cultures throughout human history.[[6]](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger#cite_note-6)

In [Ancient Egyptian mythology](https://en.wikipedia.org/wiki/Ancient_Egyptian_mythology), a [*ka*](https://en.wikipedia.org/wiki/Egyptian_soul) was a tangible "spirit double" having the same memories and feelings as the person to whom the counterpart belongs. *The Greek Princess* presents an Egyptian view of the [Trojan War](https://en.wikipedia.org/wiki/Trojan_War) in which a *ka* of [Helen](https://en.wikipedia.org/wiki/Helen_of_Troy) misleads Paris, helping to stop the war.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)] This memic sense also appears in [Euripides](https://en.wikipedia.org/wiki/Euripides)' play [*Helen*](https://en.wikipedia.org/wiki/Helen_(play)), and in [Norse mythology](https://en.wikipedia.org/wiki/Norse_mythology), a *[vardøger](https://en.wikipedia.org/wiki/Vard%C3%B8ger" \o "Vardøger)* is a ghostly double who is seen performing the person's actions in advance. In [Finnish mythology](https://en.wikipedia.org/wiki/Finnish_mythology), this pattern is described as having an *[etiäinen](https://en.wikipedia.org/wiki/Eti%C3%A4inen" \o "Etiäinen)*,[[7]](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger#cite_note-7)[[8]](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger#cite_note-8)[[9]](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger#cite_note-9) "a firstcomer".[[10]](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger#cite_note-10) The doppelgänger is a version[[*clarification needed*](https://en.wikipedia.org/wiki/Wikipedia:Please_clarify)] of the [Ankou](https://en.wikipedia.org/wiki/Ankou), which is a personification of [death](https://en.wikipedia.org/wiki/Death) that appears in [Breton](https://en.wikipedia.org/wiki/Brittany), [Cornish](https://en.wikipedia.org/wiki/Cornwall), and [Norman](https://en.wikipedia.org/wiki/Normandy) folklore.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

See also

[Vardøger - Wikipedia](https://en.wikipedia.org/wiki/Vard%C3%B8ger)

The word *[vardøger](https://en.wiktionary.org/wiki/vard%C3%B8ger" \l "Norwegian" \o "wikt:vardøger)* is probably from [Old Norse](https://en.wikipedia.org/wiki/Old_Norse) *[varðhygi](https://en.wiktionary.org/wiki/var%C3%B0hygi" \l "Old_Norse" \o "wikt:varðhygi)*, consisting of the elements *[vǫrð](https://en.wiktionary.org/wiki/v%C7%ABr%C3%B0" \l "Old_Norse" \o "wikt:vǫrð)*, "guard, watchman" (akin to "warden") and *[hugr](https://en.wiktionary.org/wiki/hugr" \l "Old_Norse" \o "wikt:hugr)*, "mind" or "soul". Originally, vardøger was considered a [fylgja](https://en.wikipedia.org/wiki/Fylgja" \o "Fylgja), a sort of guardian spirit.[[2]](https://en.wikipedia.org/wiki/Vard%C3%B8ger#cite_note-2)

Stories typically include instances that are nearly [déjà vu](https://en.wikipedia.org/wiki/D%C3%A9j%C3%A0_vu) in substance, but in reverse, where a spirit with the subject's footsteps, voice, scent, or appearance and overall demeanor precedes them in a location or activity, resulting in witnesses believing they've seen or heard the actual person before the person physically arrives. This bears a subtle difference from a [doppelgänger](https://en.wikipedia.org/wiki/Doppelg%C3%A4nger), with a less sinister connotation. It has been likened to being a phantom double, or form of [bilocation](https://en.wikipedia.org/wiki/Bilocation). In [Finnish folklore](https://en.wikipedia.org/wiki/Finnish_folklore), the concept is known as *[etiäinen](https://en.wikipedia.org/wiki/Eti%C3%A4inen" \o "Etiäinen)*.