INFO WARS: THE NEWS AFAKENS

ME210 Project, Winter 2017
Project Performance Check-off *at any time before* 2017-03-10 16:00
Project Presentations on Sunday, 2017-03-12, 19:00 in the 550 Atrium
A full checkpoint/review schedule appears on the last page.

Introduction

"Fake news wins elections."
—Albus Percival Wulfric Brian Dumbledore

The 2016 presidential election was notable for the truly overwhelming number of demonstrably false stories, articles and blog posts spreading like wildfire over social media sites. A Stanford study showed that fake news stories were shared nearly 40 million times on Facebook alone[1]. Over half of these stories were believed by those who read them. As engineers we usually consider this to be a problem for politicians and journalists, but even science and technology can be misrepresented, so we must be familiar with the rise of fake news.

Modern politicians have discovered that it is imperative to control the prevailing impression formed by the combination of fake and real news that voters see. A strategy that has proved effective is to constantly bombard your opponent with fake news through social media channels, while also fact-checking your opponent's stories to prevent them from affecting your voters.

Realizing that there is now a brilliant new class of ME210 students, politicians on both sides of the aisle have clamored for access to teams who can help

[1] http://web.stanford.edu/~gentzkow/research/fakenews.pdf

them navigate the complicated landscape of our new post-truth society. After ~~hefty emoluments~~ careful consideration, the ME210 Teaching Team has realized that this is a great learning opportunity for you all! Your task, should you choose to accept it (you must accept it; The State wills it) is to design and build a machine capable of winning the Info Wars.

Project Specification Summary

"You pass butter."
—Antonio "Tony" "Iron Man" "Genius Playboy Billionaire Philanthropist" Stark

The objective of this competition is for your robot to sway as many of the three social media sites in your favor as possible. This is achieved by posting more fake news stories to your opponent's social media sites than they post to yours.

Posting fake news stories is accomplished by launching Alternative Facts (~1.75" Nerf balls) from your side of the competition field through the **N**ew**S** **F**eed **W**indow (NSFW) at the top of each of the three social media sites on your opponent's side. You may, however, also choose to defend your own social media sites by Fact Checking (pressing a pressure sensitive pad on the ground). This does not score points, but will initiate Fact Checks (a physical blockade) that temporarily blocks fake news from entering the News Feed Window on your social media sites.

An Info Warrior 'bot starts in the Safe Space (a loading zone in your Echo Chamber) and may be loaded with up to 12 Alternative Facts at a time. The Info Warrior must leave the Safe Space to launch the stories, and can only be reloaded when it returns to the Safe Space. Each of the three social media sites will favor whichever competitor has posted more fake news, and the winner of the round will be whoever is favored by more social media sites at the end of 2 minutes and 10 seconds.

PROJECT STRUCTURE GUIDELINES
Projects are to be completed in teams of three or four. While it might seem more efficient to divide the work for the project and allocate responsibilities to the team members with the most relevant expertise, keep in mind that you will learn more if you have everyone somewhat involved in every task, and **especially if every team member has some responsibility outside of their comfort zone**. This also ensures that the whole team will not be stuck waiting

for work that only one person can understand, and the all members of your team will be able to participate in late-stage troubleshooting if everyone has some experience with all aspects of your machine.

So – don't specialize! Specialization is taught in all other courses at Stanford. You signed up for ME210 because you wanted to escape specialization! True Mechatronics Engineers can do it all, and this is your chance to learn some of the things you may not already have known way back before Week 0!

SCHEDULE OUTLINE

- **First Review: February 21 in class (T+5 days)**
- **First Checkoff: February 24 by 23:59 (T+8 days)**
- **System Integration Checkoff: March 7 by 23:59 (T+19 days)**
- **Final Performance Checkoff: March 10 by 16:00 (T+22 days)**
- **Competition: March 12 at 19:00 (T+24 days)**

Project Specification Details

"If you re-use a piece of code often enough, it becomes the standard."
—*Chief Engineer Scotty*

The following section contains a detailed description of the rules and regulations for each aspect of this tournament. Please read this carefully, and feel free to consult with the teaching team to clarify any ambiguities.

INFO WARRIOR REQUIREMENTS

- Each student team will be responsible for designing, building, and demonstrating an Info Warrior (robot). The Info Warrior is an autonomous machine which will compete in the Info Wars according to the specifications and rules defined in this document.
- Each Info Warrior must be a stand-alone entity, capable of meeting all project specifications, and must operate completely un-tethered during grading and competition.
- Each Info Warrior shall incorporate an easily accessible toggle switch on its top which will serve as an emergency stop switch. The switch shall cut all power to the machine when toggled.
- The Info Warrior's control software should be executed from the flash memory of one or more Arduino(s). Workstations will not be permitted to be tethered to the Info Warrior during its operation. Consult with the teaching team if you have a strong preference for using a different microcontroller. Should you decide to use a different microcontroller, the teaching team will not provide support for debugging microcontroller-related issues.
- Power for the Info Warrior must be supplied by batteries, which are to be carried on board each Info Warrior. Each team will be provided with two 7.2V NiMH rechargeable battery packs. The use of fuses or circuit breakers is strongly encouraged. Additional NiMH batteries may be used if desired, and may be purchased (depending on availability).
- Use of Li-ion, LiPo, and Lithium primary batteries is strictly forbidden.
- Each Info Warrior is required to fit within a 12" × 12" × 12" cube at the start of a round. An official ME210 Dimension Verification Enclosure (DVE) will be used to ensure that each Info Warrior fits within the specified maximum volume.
- At no point may the Info Warrior's dimensions more than double in any direction.
- Info Warriors are limited to a maximum capacity of twelve (12) Alternative Facts at any time.
- Info Warriors are not special snowflakes. They must be robust to all normal game interactions - including, but not limited to: collisions with any part of the Internet, stray projectile Alternative Facts, and old (but still dangerous) Alternative Facts that are just rolling around on the Internet.
- Each Info Warrior must be constructed as part of ME210 activities during the remainder of the quarter. It may not be based on a commercial or otherwise pre-existing platform. Rulings from a member of the teaching team may be requested if there are questions about the content of your Info Warrior.
- Each team is limited to an expenditure limit of US$200 for the materials and parts used in the construction of the project. The cost of the two provided NiMH battery packs, fuses/circuit breakers, the lab kit components (including a single Arduino Uno per team member) do not count towards this limit.

THE INTERNET (PLAYING FIELD)

- The Internet will be constructed from particle board, the playing surface of which will be uniformly covered with white laminate.
- The Internet will be evenly divided into 2 separate regions (each called

Echo Chambers) by a big, beautiful center divider; one side for each Info Warrior.

● The two Echo Chambers are physically identical, and will be placed side-by-side to form the entire Internet. Each Echo Chamber will measure 8' × 4', and the dimensions of the fully assembled Internet are 8' 1½" long × 8' wide. See the layout diagram for an Echo Chamber below (full sized diagram attached in the Appendix).

● A strong border will be installed around the perimeter of each Echo Chamber. This will serve to clearly demarcate the boundaries of the Internet, and to ensure that Info Warriors are not able to navigate beyond the edges of their Echo Chambers. The borders will be constructed of ¾"-wide wooden boards and be 4" tall relative to the playing surface.

● The big, beautiful center divider will separate the two Echo Chambers, and will constitute the strong borders from each half placed adjacent to each other. The total thickness of the center divider will be 1½". There will not, however, be any big, beautiful doors, or pathways of any kind between the two Echo Chambers, and UC Berkeley will reimburse us for this divider.

● Each Echo Chamber will have a Safe Space (loading zone) along the left side facing your opponent. The Safe Spaces at opposite corners of each other with respect to the entire Internet.

● Three Social Media Sites will be located just outside of each Echo Chamber, behind the long edge, placed at 24" intervals from each other.

● The Fact Checker buttons are pressure sensitive pads (3" x 11") located on the playing surface in front of each Social Media Site.

● Each social media site's Fact Checker button will be separated by a smaller (but still beautiful) divider wall (1" x 6") and 4" tall, as indicated in the Echo Chamber layout diagram.

● A 1" wide non-reflective black tape line runs the length of each half of the Internet, along the centerline. Additional strips of non-reflective tape are perpendicular to the centerline as indicated in the Echo Chamber layout diagram.

"...But, Her E-Mails..."
—Sheev "Papa" Palpatine, Galactic Emperor
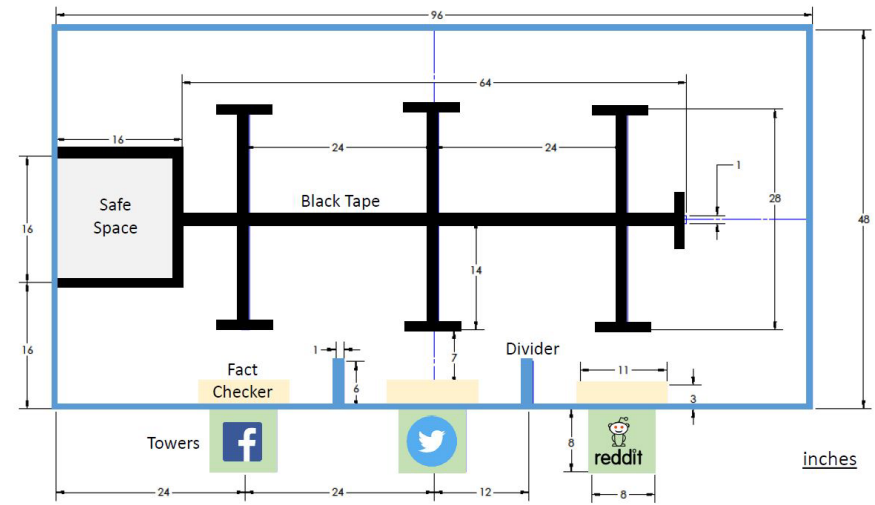
Echo Chamber Layout Diagram (opponent half is identical).[2]

ALTERNATIVE FACTS

● Alternative Facts are represented by spherical, lightweight balls made of closed-cell foam, approximately 4.5 cm in diameter and with a mass of 2gm. Detailed specifications for the Alternative Facts will not be provided; Instead, each team will be issued a set of 5 Alternative Facts, and the Alternative Facts themselves will serve as representative of the specifications. Note that despite their appearance, they are **not** "Nuclear Nerf Balls" (NNBs).

● Intentional targeting of opponent Info Warriors using Alternative Facts is not permitted. However, once in play, Alternative Facts are valid components of the Internet, and Info Warriors may need to devise strategies overcome their impedance.

SAFE SPACES

● Each side will have a Safe Space (16" x 16") as indicated in the Echo Chamber diagram.

● Info Warriors will begin the competition completely within the Safe Space,

in a random position determined by a member of the teaching team.

● The Safe Space will be marked with black, non-reflective tape, and will have an IR beacon elevated at 15" above the playing surface. This beacon will modulate at a predetermined frequency (5.5kHz) and at a 50% duty cycle.

SOCIAL MEDIA SITES

● Each of the three social media sites on each side consist of a 26" high (relative to the playing surface), 8" wide tower.
● The News Feed Window (where your Info Warrior will have to shoot Alternative Facts through) is a 6" diameter circle, with the center at 22" above the playing surface.
● Each of the social media site towers will have an IR beacon to indicate their location, elevated at 15" above the playing surface.
● All the social media sites' IR beacons will be modulated at a single frequency (1 kHz). Additionally, the duty cycles of the IR beacons will be modulated to signal the status of the target social media site. A 25% duty cycle will be emitted from your opponent's media sites if your party is in control of that particular social media site, while a 50% duty cycle will be emitted from your opponent's media sites if either your opponent's party is in control, or you are currently tied for control.
● A Fact Check may be initiated by pressing the Fact Checker pad on your own side of the playing field. When a Fact Check has been initiated, a physical blockade will temporarily cover the News Feed Window. For the first 4 seconds the entire window will be blocked and the IR beacon will be switched off. After this, the effect of the Fact Check will begin to wear off as the news cycle moves on. The IR beacon will switch back on, and the window will gradually open over the next 8 seconds.
● Any additional presses on the Fact Checker pad will be ignored until the News Feed Window returns to being fully unobscured by the Fact Check blockade.

"They don't want you to win. So we gonna win more. We gonna live more. We the best."
—*Mary Poppins*
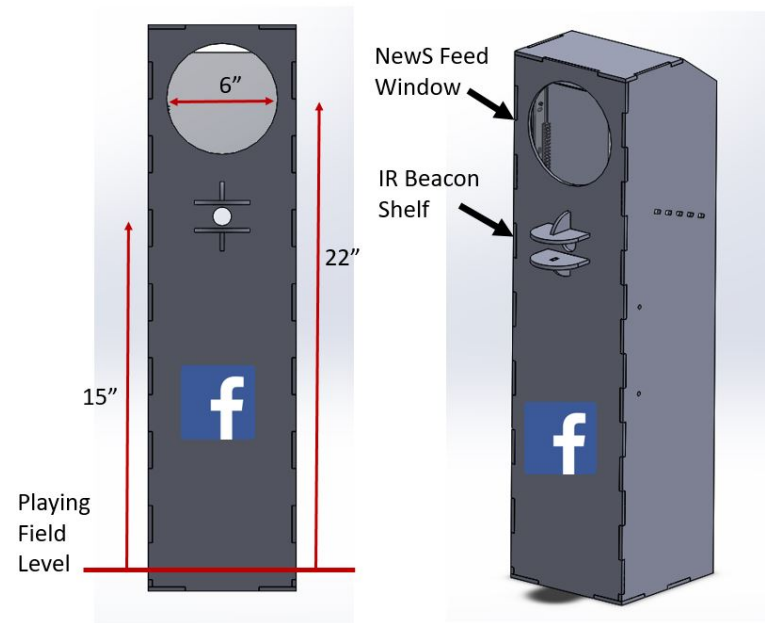
Social Media Site Tower Diagram (Front and Isometric Views)

Rules of Engagement

● Rounds last for 2 minutes and 10 seconds. The Info Warrior that is favored by the most social media sites at the conclusion of the round wins, and progresses to the next level of the tournament bracket. Ties will be broken by the total number of Alternative Facts delivered to opposing Social Media Sites.
● Info Warriors must automatically freeze all motor functions 2 minutes and 10 seconds after the start of a round.
● Info Warriors are placed inside their respective Safe Spaces at the start of each 2-minute 10 second round, with up to their full capacity of Alternative Facts.
● The orientation (yaw) and the exact position of the Info Warrior inside the Safe Space will be subject to randomization, determined by representatives of the Teaching Team.
● A verbal start command will be issued by a member of the Teaching Team, at which time the human Info Warrior team members - using

their totally, completely normally-sized hands - will actuate a button, switch or other simple start indication to their Info Warrior. This is the last human interaction permitted with the Info Warriors until the 2-minute and 10 second round has concluded, except for reloading of Alternative Facts within the Safe Space, and emergencies requiring human intervention as determined by the Teaching Team.

● Info Warriors are to distribute their Alternative Facts among the social media sites with the objective of winning each site. An Alternative Fact is counted as having influenced a Social Media Site when it crosses the threshold of the News Feed Window.

● Each of the three social media sites favors whichever competitor has delivered the most Alternative Facts to the appropriate side

● Info Warriors may enter the Safe Space at any time to be reloaded with up to 12 Alternative Facts, and must be entirely within the Safe Space whilst reloading.

● Info Warriors must neither be in contact with, nor overlapping, any part of the Safe Space whilst launching fake news attacks.

● No element or action of an Info Warrior may make contact with an opponent or impede the movement of an opponent, or alter any aspect of the Internet, social media sites, or associated structures in any way.

● Intentional jamming of your opponent's sensing abilities is prohibited (e.g. Info Warriors may not incorporate decoy IR beacons to confuse the opponent.). Additionally, no hacking of opposing teams' servers is allowed.

● Info Warriors are not to breach the perimeter of the opponent's Echo Chamber.

● No part of the Info Warrior may become ballistic and leave the field of play. Alternative Facts are not considered part of the Info Warrior.

● The competition seed position will be determined by the order in which the team performed the graded check off (see performance requirements).

● Human team members are also not allowed to position themselves

in a way that will interfere with the activities of the opponent's Info Warrior. Polite, "G-rated" heckling is permitted, of course. Think of the children!

Performance Requirements

"Inhaling the magic smoke gives you its powers. I have the power to MOSFET. True story, bro."
—Elon Musk

●For the purposes of grading, the minimum requirement for each Info Warrior is to "beat a brick" (the standard, inanimate ME210 check-off opponent). Specifically, each machine must win the favor of **at least two of their opponent's Social Media Sites** by delivering Alternative Facts, and initiate the Fact Checker on **at least one of their own Social Media Sites**. This must take place within 2 minutes and 10 seconds, when competing against – literally – a brick.

We have the best bricks.

●Failing to meet the minimum requirements during the first official attempt will result in having to meet the requirements 2 times in a row in the next official attempt. Failure to meet the requirements 2 times in a row will increase the number to 3 times, which must also be consecutive. Subsequent failures do not increase this count beyond 3.

●It is important for everyone to remember that the minimum performance requirement is the goal for the class. **There are no "extra credit" points awarded for performance above this minimum.** Student teams are strongly encouraged to strive for

demonstration of the minimum performance functionality as early as reasonably possible, so that the members of these teams may return to their regularly-scheduled lives.

● The results of the tournament held at the public presentation session will not affect grading. The Public Presentation is purely an opportunity for you to enjoy the devices you've created, and to show your friends and families why you have disappeared for 3 weeks. It will be the largest audience to ever witness an ME210 competition, period. There will be millions there, millions of beautiful people.

Other General Guidelines and Safety

"Power to ground. 60% of the time, it works every time."
—Bilbo Baggins

● All machines and devices must be safe to users, to the lab, and to any spectators.
● For this project, excessively-high-velocity ball discharge is discouraged. The teaching staff reserves the right to require you to reduce the speed of any mechanism for safety purposes.
● All projects shall respect the spirit of the rules, as established in this specification and in the culture of ME210. If you are considering something that may bend or violate the rules, you shall first consult with a member of the teaching staff. Interpretations and rulings are the sole domain of the teaching staff.
● The powers of the Teaching Staff to protect ME210 and its participants are very substantial and will not be questioned.
● Tolerances on the dimensions of the Internet are ±1 inches unless otherwise specified.
● Although ungraded, teams are encouraged to work in creative themes and aesthetics for their Info Warriors and themselves.
● Pyrotechnics of any kind are prohibited.

Evaluation

”(ᕙ°□°)ᕗ ⌒ ┴┴”

—You

“¯_(ツ)_/¯”

—The Brick

GRADING CRITERIA

1. **Concept (25%)** This will be based on the technical merit of the design and programming for the machine. Included in this grade will be evaluation of the appropriateness of the solution, as well as innovative hardware and software and use of physical principles in the solution.

2. **Implementation (25%)** This will be based on the machine displayed at the evaluation session. Included in this portion of the grade will be evaluation of the physical appearance of the machine and the quality of its construction. Aesthetics will not be judged, rather, craftsmanship and finished appearance are the focus of this portion.

3. **Performance (25%)** Based on the results of the performance during the evaluation session.

4. **Coach Evaluations (10%)** Based on the four project milestone reviews (see below).

5. **Report (15%)** This will be based on an evaluation of the final report. It will be judged on clarity of explanations, and on the completeness and appropriateness of the documentation. This report should be prepared in HTML format (as a website), and submitted as a compressed ZIP archive on Canvas ready for publication on the (real) Internet.

DOCUMENTATION REQUIREMENTS

- Each design team shall maintain a logbook, which may be in electronic format.
- At a minimum, this logbook shall contain up-to-date mechanical, electrical, and software documentation. This is expected to also include things such as task lists, schedules, sketches, notes from brainstorming meetings, solid models, schematics, code listings, notes about software and hardware versions, and the like.
- It is acceptable for the logbook to be a collection of links to various collaboration SaaS tools such as Asana, Trello, OnShape, Gdrive, GitHub, etc. as long as every team member has access to all of such tools at all times.
- An HTML-based final report describing the technical details of your machine is required.
- The report shall include sufficient detail that a person skilled at the level of ME210 could understand, reproduce, and modify the design.
- You must turn in the actual HTML source code and all assets for your report, rather than building a site on a third-party host and linking to it. Assume that your site will be reviewed on a computer not connected to the Internet.
- Using software tools to edit HTML in ways other than editing the code directly is permitted, as long as the final submission is in HTML format.
- These reports will be posted on the public ME210 website in the future, so please make sure that the content is appropriate and do not disclose information that you do not wish to be made permanently public.

A NOTE ON RESOURCE PLANNING

This is a *mechatronics* project design activity. While aspects of electronics and software design were emphasized this quarter, it is important to realize that *any mechatronic project also requires substantial mechanical design*. Grading in this class is based on complete system design and function. Therefore, a "beautiful" electronics system is not a successful project if the mechanical part of the machine fails. Be certain to allocate resources (energy, time, and people) to all aspects (including mechanical) of this project.

"It's not a bug… it's a feature."
—Bruce Banner

Project Milestones

EVENT	DELIVERABLES
First review Tuesday, 2017-02-21 09:00 (in class)	*Computer presentation of ~8-10 min. duration* At most 4 slides with at least 4 design concepts (can be of entire robot or of relevant subsystems), with sketches Time schedules, project plan/variances Personnel assignments
Second Review by Friday, 2017-02-24 23:59	*Turn in documentation (Lab or Canvas)* Calculations System block diagram Preliminary testing results
Third Review by Tuesday, 2017-02-28 23:59	*Presented to coach; check-off by teaching staff* Demonstration of all functional subsystems per block diagram: ball delivery, beacon sensing, tape sensing, mobile platform, etc.
Fourth Review by Tuesday, 2017-03-07 23:59	*Check-off by teaching staff* Integration of subsystems Working software to test all systems Working versions of all systems
Grading Session by Friday, 2017-03-10 16:00	*Check-off by teaching staff* Demonstrate minimum functionality on the playing field set up in the lab or in the 550 Atrium
Final Presentations Sunday, 2017-03-12 19:00	*Public presentation and tournament in the 550 Atrium* Finished, operational, presentable machines
Final Report by Friday, 2017-03-17 17:00	HTML format Suitable for publishing on ME210/SPDL website

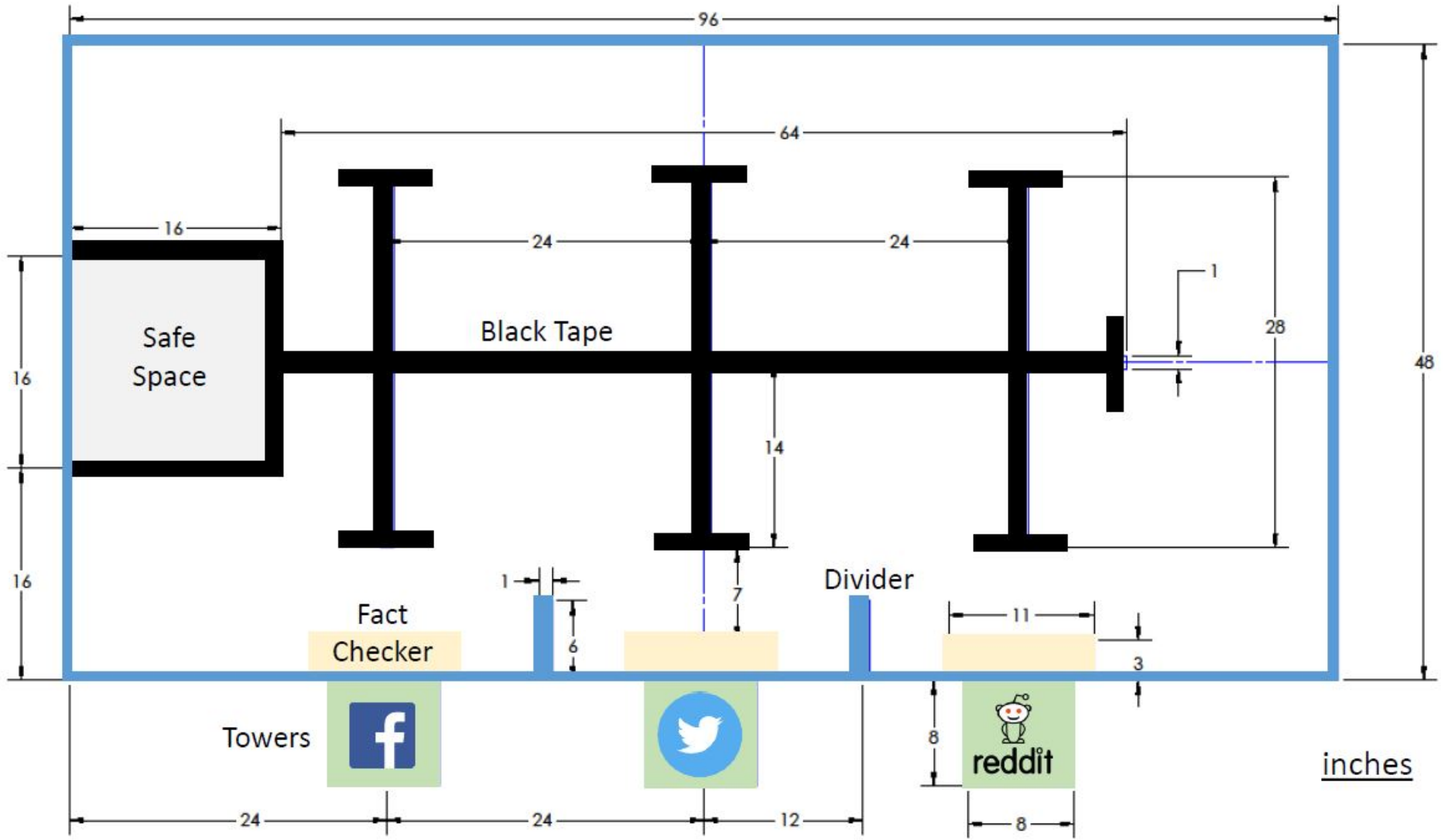" #1: We've got this guy Not Sure.
#2: He's got a higher IQ than ANY MAN ALIVE.
And #3: He's going to fix EVERYTHING!"
—Wolf Blitzer

Appendix

Echo Chamber Layout Diagram (opponent half is identical)