

# ComSSA x IET Hackathon 2021

## Winning Project

By team: Stack Underflow

For ComSSA's very first Hackathon last year, the competition involved taking three days to think up and develop the best solution to one of three different issues related to first contact with aliens. Our team chose to focus on the issue of establishing communications with an alien spacecraft that had just arrived on the edge of our solar system!

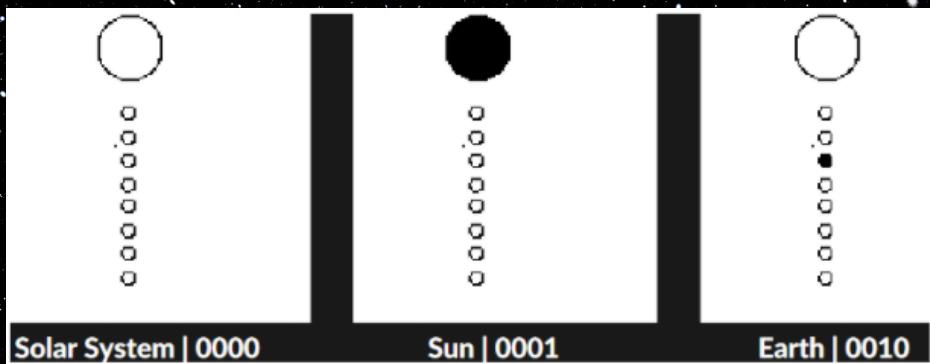
As our team discussed how best to accomplish this, we realized just how complex of a problem this is. How do you communicate not only with someone who doesn't speak the same language as you, but might not even communicate the same way you do? We could have almost nothing in common with these aliens, they might not even experience the world the same way we do!

So we started from the ground up, what is something that every space faring culture MUST have in common? Mathematics. Math that lets you measure the world, math that lets you plot coordinates through space, math that lets you build machines that can lift you out of the atmosphere and into the stars. And as you'll find if you study computing, math can be used to communicate!

Our idea was, that if we can send some signal to the alien craft, we could establish a new means of communication using our shared knowledge of mathematics. To accomplish this, we would send beams of light to the alien vessel in repeating patterns to distinguish ourselves from any chaotic background data that could also be present in space. The chance the aliens would be able to detect these beams is high, due to the necessity to at least have some ship-bound systems that can detect light when moving through space, even if the aliens themselves didn't experience light the same way we do; their computers could likely interpret what we sent to their ship for them. The patterns sent would be encoded in binary (since a spacefaring civilization should have some idea of different number systems, and it's easy to represent with pulsing light) and contains a number of things.

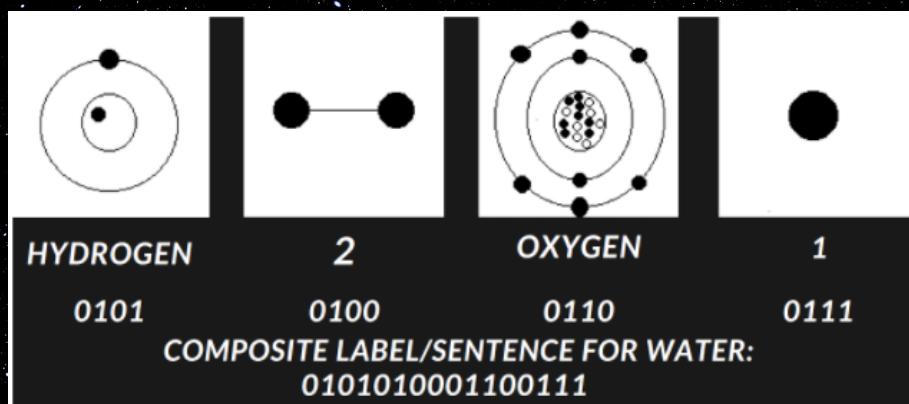
The Messages we send would contain:

- Start Flag: An ascending sequence of prime numbers, up to our highest dimension. The last two prime numbers in this sequence will form a Semiprime.
- A sequence of 0s and 1s that when formed into a 2D image with the dimensions of the prime factors of our Semiprime number, creates a type of dot-matrix style image. (The nature of semiprimes making it so that the image can only be represented by a specific set of dimensions)
- Label Separator Flag.
- A number that will become a word in our new shared dictionary, representing the image that the prior sequence creates.
- End Flag: Same as the start flag.



Examples of images and labels we could associate with them.

Using these messages, we can begin communicating information to the alien craft to establish both our presence as a fellow sapient and technologically capable species. As well as form a new dictionary of words with associated imagery that can be used to establish a standard of communication that we can share with the aliens, with the initial words involving universal constants like math, shapes, and chemistry, and gradually building up until we can more formally communicate with them.



Once words are established, they could be combined into more complex ideas.





Kristian Rados demonstrating Stack Underflow's prototype.

