[1a] Company name:

telex

[1b] Company url, if any:

www.plasmo.ai

[1c] If you have a demo, what's the url? For non-software, demo can be a video.

www.timfoldy-porto.com/glove/yc.html

[1d] Describe your company in 50 characters or less.

Sketch and sculpt to build 3D models

[1e] What is your company going to make?

We're making Plasmo, a web-app that automatically turns users' sketches into 3D products, and Vulcan, a haptic glove that lets users interact with 3D models as if they were touching them in real life. Our products are two sides of the same coin, working together to build towards our dream of a virtual makerspace similar to Iron Man's holographic workshop. Plasmo helps teams go from idea to product faster by making it easier to create and share 3D projects. By introducing the sensation of touch into the digital world, Vulcan makes building 3D models as easy as sculpting clay.

[1f] Where do you live now, and where would the company be based after YC?

Bennington, USA (Tim) + Shenzhen, China (Antonio) / San Francisco, USA

[3] FOUNDERS

[3a] Please tell us about an interesting project, preferably outside of class or work, that two or more of you created together. Include urls if possible.

We initially got together to enter the XPrize ANA Avatar competition—to build a tele-operated humanoid robot (http://timfoldy-porto.com/projects/teleAvatar.html). We ended up producing detailed plans for the robot (CAD, circuit schematics, control software) plus a few physical prototypes of robot subsystems before running out of capital and selling the IP to a Chinese manufacturing company for $20,000. We used the money from that sale to pivot to what we're currently working on.

[3b] How long have the founders known one another and how did you meet? Have any of the founders not met in person?

Met in a classical mechanics class in 2017, when Tim was a sophomore and Antonio was a first-year. We went on to take a variety of physics, math, & engineering classes together over the years.

[4] CATEGORY

[4a] Which category best applies to your company?

Virtual reality

[5] PROGRESS

[5a] How far along are you?

Our full product—the one which lights up customers' eyes—is the virtual makerspace, which is achieved through the combination of our software (Plasmo) and hardware (Vulcan). In this early stage, however, it makes the most sense to talk about the software and hardware separately.

Hardware (Vulcan):

- Prototype #1 (physically big and bulky, wires + processing located off board) completed in October 2020
- Prototype #2 (compact final form factor, adjustable / comfortable, wireless / embedded circuitry included onboard) complete in March 2021
- One glove dev kit has been shipped to a beta tester
- Currently working to make and ship gloves for 4 other beta testers

Software (Plasmo):

- MVP, which lets users sketch in 3D and convert those sketches into a mesh, completed in March 2021; now we're gearing up for the beta launch
- We worked extensively with a Chinese shoe design company (Equalizer) and 5 independent designers to polish the features of the software

[5b] How long have each of you been working on this? How much of that has been full-time? Please explain.

We started working on a related project back in June 2019 (mentioned in section 3), sold the IP from that project in November 2019 and pivoted to haptic glove + 3D modeling app while still attending college. Both of us have been full time since May 2020.

[5c] Are people using your product? (y/n)

Yes

[5d] How many active users or customers do you have? If you have some particularly valuable customers, who are they? If you're building hardware, how many units have you shipped?

Hardware (Vulcan): we've shipped one beta unit, four more in the pipeline, so 1-5 active users depending on when this application is read. Most of our beta testers are artists, including a musician, a sculptor, a visual artist, and an architect, who are planning to use the glove to enhance their creative work. We've recently been working closely with the musician to develop an app that lets the glove generate open sound control (OSC) commands, which can be used to create or control music in Ableton Live, Logic, etc. Another beta tester is a computer scientist at MIT working on novel digital interfaces.

Software (Plasmo): one user for the pre-launch version of the product, a shoe-design company based out of Shenzhen. We've had multiple testing sessions / demos with other 3D modelers and designers, all of whom are excited about using the beta version of Plasmo once it launches.

[5e] Do you have revenue? (y/n)

no

[5f] Anything else you would like us to know regarding your revenue or growth rate?

no

[5g] If you've applied previously with the same idea, how much progress have you made since the last time you applied? Anything changed?

n/a

[5h] If you have already participated or committed to participate in an incubator, "accelerator" or "pre-accelerator" program, please tell us about it.

n/a

[6] IDEA

[6a] Why did you pick this idea to work on? Do you have domain expertise in this area? How do you know people need what you're making?

We've been convinced that there's a better way to build 3D products ever since we started 3D modeling in middle school. In all of our projects, it's taken several painstaking days to build

simple shapes that we can sketch in a minute on paper. Our frustration peaked last year when we struggled to build organic parts for the tele-operated robot. There's simply no solution that allows us to quickly visualize curvy, amorphous shapes in 3D. So we decided to solve our own problem: to make 3D modeling as easy as sketching and sculpting.

We chose to build a haptic modeling interface for two reasons: 1) immediate and nuanced tactile feedback is vital to our creative process; 2) humans are adept at manipulating 3D objects with their hands, and the device simply augments this innate capability. It is the most natural interface to use for building 3D models.

We are uniquely positioned to tackle this problem because of our experience and technical expertise. Tim has invented multiple generations of robotic exoskeletons throughout high school and college and Antonio has deployed AI systems for physics learning and 3D interactive tools throughout his research. This project is the culmination of our learnings, and we treat it as our life's work.

Aside from being our own users, we also interviewed 15 architects, animators, and product designers to verify the need. Initially, we made a fake landing page that gathered the attention of some of the world's best designers in the media and automotive industry (e.g. Oculus and Aston Martin). Then we visited offices and factories of three product design companies, and they all expressed a need for building 3D models cheaper and faster. Our customers taught us that they are planning to deploy 3D models in their production and marketing channels, and that their need for high quality 3D models is going to dramatically increase in the coming years.

[6b] What's new about what you're making? What substitutes do people resort to because it doesn't exist yet (or they don't know about it)?

Our tool is a new paradigm of 3D design. It makes building 3D models as easy as sketching on paper and sculpting a piece of clay. In some way this has been the holy grail of 3D modeling since SketchPad in the 1960s.

Based on our interviews, the majority of our target users still create their concept drawings using 2D design tools like Sketchbook on iPad. They then transfer these sketches to professional 3D modelers, who typically work in another city. This makes design iteration painfully slow: the designer and the modeler have to communicate back-and-forth via pdfs and screen-shots for several weeks until the product is finalized. Like us, our users find current 3D modeling tools way too cumbersome to quickly visualize and communicate their ideas, and thus they're stuck in an inferior workflow.

Plasmo enables designers to build production-ready models directly by sketching. The tool removes an entire branch of the existing workflow, and accelerates the time to production from several weeks to a few days.

For the most part, our customers still perceive haptic gloves as sci-fi technology reserved for advanced research. This perception isn't helped by existing haptic glove vendors, who, with thousand-dollar price tags, typically target enterprise customers rather than small-scale design firms. In contrast, we can sell our glove with both tactile and force feedback for a couple hundred dollars, thereby unlocking an entirely new segment of users.

[6c] Who are your competitors, and who might become competitors? Who do you fear most?

Our main competitors are the keyboard + mouse combo and devices like the Oculus trigger-type controllers. Every time someone sits down to create 3D models or interact with a virtual world, they have a choice between a computer + keyboard + mouse, a tablet + stylus, or a VR headset + controller (or a haptic glove, if they're a futurist). We're certainly keeping an eye on other players in the glove space (HaptX, Manus VR, SenseGlove, Dexmo, VRGluv), but our greatest fear is that those operating in the interface layer (Apple, Logitch, Razer, Oculus, Vive, Microsoft, etc.) realize the potential for haptic interaction and leverage their economies of scale and their brands to beat us.

On the software side, most web apps (e.g. SketchUp, Vectary, and Clara.io) innovate on the UI and collaboration feature, simply offering "Your existing CAD interface but on the web". There are companies (e.g. Gravity Sketch and Adobe Medium) that use VR to transform the modeling workflow. From our experience, these tools are great in creating a rough sketch, but building meshes (especially without haptic feedback) is still very laborious. Plasmo automatically turns the sketches into 3D models, which saves the user several hours of modeling time.

[6d] What do you understand about your business that other companies in it just don't get?

The 3D modeling process is incompatible with current input devices. Doug Engelbart invented the mouse to manage 2D information, not to navigate 3D worlds. As a work-around, CAD software had to use complex buttons and keyboard shortcuts that make the interface confusing. People treat the steep learning curve of CAD as a fact of life, without noticing that everyone can create using pencils, paper, and clay from birth. We believe that tremendous productivity is locked away in the current local-minimum of sub-optimal input devices and modeling environments.

[6e] How do or will you make money? How much could you make?

We're aware that developing a new 3D modeling paradigm is a bold bet. The market signals between our software and hardware aren't obviously correlated right now, but as 3D modelers ourselves we know that our project has a huge potential upside. To hedge our bet, however, our plan is for the hardware and software to be independently profitable.

Plasmo is a subscription-based service where the user pays for additional storage and access to advanced collaboration features and digital assets, such as special templates, materials, and textures. The market size of the CAD industry is about $9B, and the market is consistently growing at 10% annual rate.

Vulcan will generate revenue the old fashioned way: by selling goods to consumers at whatever profit margin lets us stay competitive. Initially, we'll be selling to creative professionals who use the Vulcan glove to enhance their existing digital workflow by introducing gesture-based controls (for an example of this, check out the MiMu Gloves for music). In this case, Vulcan competes with hardware interface devices for creative professionals (digital pens, Wacom tablets, etc.). For reference, the digital pen TAM was estimated at $1.5B for 2018 (Grand View Research, 2019).

As soon as possible, we'll integrate Vulcan into Plasmo as the input device of choice. When this happens, Plasmo will become the "killer app" for Vulcan, kicking off a flywheel effect between the software and hardware with each making the other more valuable to customers. At this point we'll be competing with the major creativity platforms—Adobe creative suite, the entire Wacom suite, Autodesk, AR / VR headset companies, etc., most of which have annual revenue in the billions.

[6f] How will you get users? If your idea is the type that faces a chicken-and-egg problem in the sense that it won't be attractive to users till it has a lot of users (e.g. a marketplace, a dating site, an ad network), how will you overcome that?

Once we start to spin the flywheel between our hardware and software, users from one platform will become users on the other. Until then however, each platform has its own user acquisition strategy:

Hardware (Vulcan): up until now we've been researching individual artists (browsing gallery websites, university connections, etc.) and cold-emailing them. Our current beta testers are excited about the glove and have been vocal in their respective communities about their planned experiments with it. We plan to grow the Vulcan user base by capitalizing on their networks.

Software (Plasmo): During closed beta, we are working with designers in our extended network. Once the software ships, we will target designers in product teams, and make it easy for them to share work among their teams.

[9] OTHERS

[9a] If you had any other ideas you considered applying with, please list them. One may be something we've been waiting for. Often when we fund people it's to do something they list here and not in the main application. (80 words)

On-demand PCB manufacturing service, similar to 3D Hubs / Xometry / Protolabs but for PCB assembly. In developing the embedded boards for the glove, we realized that there doesn't exist any reasonably priced PCB turnkey assembly company...ripe for disruption.

Software apps that contribute towards our vision of virtual makerspace but that we haven't yet built for one reason or another: 1) real-time ray-tracing in a web app for rendering 3D models online without the hassle of setting everything up, to be used as a presentation tool. We are making a ray-tracing engine for Plasmo, and we can separate it into a standalone product. 2) Github and search engine for 3D models. We use machine learning on point clouds to find similar 3D models based on sketches or key words. The version control platform could double as a portfolio management platform, sort of like SketchFab + Github.

[9b] Please tell us something surprising or amusing that one of you has discovered.
Don't use your personal account to do any type of product promotion on reddit—it's a great way to get banned from all your favorite subs.

[10] CURIOUS

[10a] What convinced you to apply to Y Combinator? Did someone encourage you to apply?
Had been thinking about it for a while, finally convinced by the Bloom / Porter.dev team from the S20 batch.

[10b] How did you hear about Y Combinator?
Conversations with some enthusiastic YC alums.