**COLLOQUIUM II**

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assignment 1

* Bring precedents and examples of 3 modes of working with computation to class next week. **See Lab 1** which will help you understand why.
  + PCB manufacturing: optimizing layout (space) and materials (consumption)
  + Database access, querying, substitution, mutability
  + Remote sensing: conversion+merging of visible (+ invisible) bands/wavelengths of light to a format legible by computers and humans alike
  + Drawing, storing, and editing vector graphics: lines, bezier curves, polygons

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* Present 3 ideas for capstone
* Write one paragraph (100-200 words) for how each idea engages meaningfully with computation
* We will assign a set of projects for reverse engineering in next week’s lab.
* Assignment submissions should be made on the [website](https://gsapp-cdp.github.io/colloquium-2-2023/) on your own page. Assignment submission instructions are [here](https://docs.google.com/document/d/1zL15lf3tCvcqyJzmI14xC1mH66ppkaqK_Z4xEn985eE/edit).

1. Peripheral Transmissions
   1. Mind/body/space/sensation

* I am interested in constructing a custom instrument that sonifies (and visually graphs) parameters exposed by the FCC open data portal + atmospheric, terrain, and other conditions local to each node in the vast physical network of US telecommunications. The instrument close a recursive loop between space, sound, and transmission + integrate the performer/performance as a breakpoint.
  + To do this, I would design and fabricate a physical device (modeled loosely after an ‘etch-a-sketch’) that allows a user to tune their device to “survey” a network of internet radio nodes. Tune along the interpolated lines between nearest nodes; rescale the map using sliders on the X and Y axes of the central ’sketch’ screen, which in turn adjusts sonic responsiveness between stations; switch between user-pan scrolling behavior and auto-pan that creates an effect like finding yourself between stations on a road trip.
  + The instrument will be standalone 3D printed or CNC cut physical interface with simple OLED display that enables adjustment of the application’s parameters with encoders and sliders. Most likely it will be driven by an Arduino microprocessor, although designing with discrete components on a printed circuit board would be a fun reach project.

Alternatively, I would also be interested in bridging the divide between analog terrestrial radio infrastructure and intangible digital streaming infrastructures, specifically as they relate to discovery.

This act of discovery has severe cultural/psycho/socio/economic ramifications as artists and listeners alike rely on centralized platforms for transmission. Whereas conventional radio and its listeners are intractably linked to a geographic center, streaming platforms typically prompt the discovery of music and speech through opaque, aspatial metadata-based systems of recommendation.

Reclaiming (or reconceptualizing) the deeply geographic (cultural etc) and spatial (ways of creating) methods in which an artist or musician practices their craft…: how far does the internet go? \*where\* are genre linkages in the post-streaming/file sharing age, and how can we think+visualize the linkages?

Another third idea could concern other generalizable methods of spatial data sonification - how can we hear a map, and what are the creative+practical uses of cross-sensory thinking and navigation? How can multi sensory interpretation of space and place alter a person’s cognition and perception? Are there ramifications on attention+memory?

Eg: the frequency of contour lines on a topographic map (or bands in a DEM) could be interpreted as pitches in a scale (frequency of change). Or the terrain can be sampled as a graphic “wavetable” and generate a waveform for a digital oscillator.

… A place can be mapped onto a piece of music, and vice-versa.

1. Sonic terrains …;..
   1. Streaming services?
   2. Web archives?

wiggly

* Design as a second-order intellectual process -> apparently more than just “getting the job done” by fashioning a quick solution but optimizing it in some way? re: ice age era hatchet
* “some argue…human accomplishment is simply a uniquely human capacity for variability, an impulse to generate a multiplicity of ways to do things in reaction to different circumstances”
  + refactoring : )
* “The human brain itself is a malleable artifact whose circuits are continually rearranged through engagement with material culture.”
* Obvious: phones, computers, search engines as extension of human intellect

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unsupervised

* How does it work?
  + Unsupervised (vs. Supervised) training of an input corpus
* what / who is in the collection
* what collections are digitized?
* what is invisible to trained networks

———

Readings 9/27:

* Ethnography
  + As Sherry Ortner puts it in her 2006 book Anthropology and Social Theory, ethnography “has always meant the attempt to understand another life world using the self—as much as it of possible—as the instrument of knowing.”
  + one thing that remains constant is a commitment to realism
  + “the use of disciplinary jargon to signal anthropological scholarship” vs “clear scholarly credibility of the author, reader’s trust of their credentials.”
* Spatial data science
  + location-prediction model (multidimensional spatial predictions), hot spots (clusters of phenomena… or just population density…), spatial outliers, and colocation.
  + first law of geography
  + Spatial data have no similar transactions [to traditional stats]; they are embedded in a continuous space.
  + MAUP (modifiable aerial unit problem) - effectively gerrymandering measurement issues (also applicable to time frames studied)
* Lexicon
  + Film aerial methodology! 2.1 million feet of film in 39,000 canisters- Corona meant reevaluating all 1:24000 quads
  + Landsat, sentinel, modis

-

remember soil conductivity for transmission of sound etc … change how audio is transmitted across space given different terrain and parameters / ecological conditions. echo generator

DREAMING TRACKS -> aboriginal songlines

<https://japingkaaboriginalart.com/articles/connection-dreamtime-songlines/>

xmind for diagrams?

<https://lastminuteengineers.com/neo6m-gps-arduino-tutorial/>

<https://www.espressif.com/en/products/socs/esp32-c3>

<https://randomnerdtutorials.com/guide-to-neo-6m-gps-module-with-arduino/>

<https://www.pjrc.com/teensy/td_libs_TinyGPS.html>

<http://arduiniana.org/libraries/tinygpsplus/>

7 segment displays?

<https://hackaday.io/project/169632-7-segment-display-array-clock>

<https://www.digitalhumanities.org/dhq/vol/16/2/000646/000646.html>

“metaphorical computer literacy — the ability to use GUIs, an act in which most people with computational devices engage through their ordinary interactions online — and symbolic computational literacy, or the ability to “code,” which remains the purview of a rare few, especially in the humanities” VIS A VIS CHATGPTS

“GUIs hide the systems that drive that production, and by extension, the labor to maintain and sustain them.”

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You have all been working on three or more ideas for your capstone project and have been exploring their contexts. Based on these first three weeks of work, write one paragraph which describes your concept or research question.

Please use these prompts to help you elaborate in writing as well as diagram and sketch out your future work.

1. What is your research question for each of your three ideas?

1. Which computational tools and design methods will be best used to explore your ideas. How do these engage meaningfully with your topic/concept/research question. How will you explore the spatial concepts embedded in your work?

* Minimal computing: Combining discrete components and microprocessors to create a device that does no more or less than it needs to
* Sensing: Integrating real-time environmental stimuli to alter the behavior of a program (e.g. global positioning, 3D orientation)
* Tripartite HCI: user GESTURAL control (encoder knobs + fader) updates VISUAL interface and is reflected in SONIC feedback

1. You have also been researching projects which are precedents to your topic/concept/research question. Present projects which best show the best current work being done around this idea?

* Norns shield, ornament and crime as open-source, open-development sound computer platforms
* Decibel Map as modeled sound maps
* Electric Walks (Kubisch) as reinterpretation/sublimation of space to the sonic dimension (Making invisible but present phenomena into observable sound via computation)

1. Does your own project move your topic/concept/research question forward? What needs to change to move it forward and why?
2. Develop sketches for the 3 capstone ideas, Your sketch should describe what each idea might look like as a final project might look like. Describe its audience/s.

* Distributed mesh network of GPS receivers + broadband access

1. Think about each project in multiple dimensions. What processes and systems do they incorporate beyond humans and computers. Since our projects all address the built environment, how does the built environment form relational systems in HCI. Please diagram your HCI+ concept.

* Re-envisioning data typically described discretely as continuous values

1. Consider whether your project might change for a different audience. Or to put it another way, is anyone/anything excluded? What are some alternative sketches if the ideas were developed for a different audience?

* Cost-intensiveness of hardware…Freeware?
  + Browser-based
  + Standalone computer program
* Solder scaries
  + breadboard+wiring only version
  + pre-populated boards
* Multisensory: consider the experience of using the device without hearing or without seeing
* Data interoperability: users should be able to import their own custom geospatial data to a device for exploration

1. What kinds of data do you need to explore to begin explaining your work in the next three weeks. Do you have proof of concept that your data is already accessible, or easy to gather?

* Natural:
  + Terrain DEM (low res):<https://www.usgs.gov/centers/eros/science/usgs-eros-archive-digital-elevation-global-multi-resolution-terrain-elevation?qt-science_center_objects=0#qt-science_center_objects>
  + Bathymetry contours:<https://www.fisheries.noaa.gov/inport/item/54364>
  + Misc vectors: natural earth
  + Satellite imagery(?): bing api
* Built
  + Building footprints (raster+vector)
    - <https://data.usgs.gov/datacatalog/data/USGS:5e432002e4b0edb47be84652>
    - <https://github.com/microsoft/USBuildingFootprints>
  + Sonic infrastructure: FCC<https://hifld-geoplatform.opendata.arcgis.com/maps/fm-transmission-towers>
  + Cell:<https://hub.arcgis.com/datasets/15dabb4108254481b591018be2598f3c/explore>

1. What scales does each of our projects investigate. Multiple scales or transcalar projects are encourage.

* Built-environment data (including propagation contours) are reliably available within bounds of USA
* Natural features are available at the global scale

You will each have 5 minutes to present your work and we will have 10-15 minutes to help each of you decide which of your three ideas has the most potential to be developed into your capstone project.

Please submit your presentation/assignment before the review on Thursday. The submissions should address all of the questions above, but it does not have to follow the exact sequence. The website, at this stage, can be a place to gather precedents, explain ideas, explore formats, or a curation of all of the above. You should feel free to reference each other’s works in progress as well.

signal loss as rhetorical tool

triangulation of cell towers

how to greater use GPS in realtime processing? pushpin style? “paths edges districts nodes landmarks” (Kevin Lynch)

“LOCATIVE MEDIA”

restofworld.org

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* Beyond HCI:
  + “Second nature” and “innate senses” … intuition as a metaphor for subconscious sensation and perception
    - bidirectional metaphor <-> describing virtual and physical space (“IRL”)
  + Lefebvre: “space as byproduct of social encounter” -> powers’ representations of space fracture social constructions of space into ***cellular arrangements***
    - space is popular as an ***empirical*** measurement device … easily divisible and observable (much harder to derive and reproduce this socially)
  + POSTMODERN HYPERSPACE ANALOGON
  + Ubicomp:
    - “Proximate future”-ism ignores present achievements.
    - Goal for persistent always-on and controllable tech ignores messiness of living
  + “Geosophical” folk mapping to emphasize local knowledge
  + What are new dimensions that can replace or augment Lynch’s images of the city? (vs Brian Ho’s direct recreation)
  + Lynch: Alienation = disorientation; orientation = disalienation
  + Neuroscience: adaptation and adaptiveness in order to continuously generate models of space (vs place?). Construction of space as memory as place. what drives vs resists this construction?

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gmaps lab:

time series, draw a line between all group mates as we diverge and converge over time

what other “dummy” agents can we include?

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sketches todo:

concentric propagation curves, overlapping as rhythmic interference

pitches or sounds of different wavelengths

where is infrastructure?

phase lines between isolines of different types

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Models+Worlds:

* Environment is Not a System:
  + This question is particularly relevant at a time of rapid climate change, mass extinction and, conveniently, an unprecedented surplus of computing. As many have pointed out, these conditions make it tempting (and lucrative) to claim that neat technological fixes can address thorny existential problems
  + Anna Tsing’s “Encounters”
  + Case study: Forest Managers that edit out (erase) non- capital-consumptive entities from the maps that are reproduced. Forest as factory
  + [Data collection and models] are contingent on decisions of what is deemed important or trivial in the eyes of the manager and therefore are profoundly driven by culture and economics, class and race.
  + Nasa ozone: reality itself was discarded as an outlier!
  + “CORRELATION IS ENOUGH” = machine learning not understanding the meaning or contextual framework underlying its training set
  + Predictive algorithms always assume the future will be consistent with the past … very troublesome for human time scales informing geological periods! And what if the past is racist!
  + Assemblage > system … fuzzier boundaries, things happen through real “encounters” with more room for nuance. Eg an encounter with a walrus and a mollusk may be more complicated than the mere reductionist transfer of energy
* Data feminism:
  + No such thing as raw data… production and collection has inherent bias
  + “CORRELATION IS ENOUGH?”
* Reconsidering Representation in College Design Curricula: HELPFUL TO CONCEPTUALIZE DIMENSIONALITY OF PROJECTS
  + Representation = re-presentation = substitution
  + Stuart Hall: “the production of meaning through language” -> meaning that symbols are first converted into language before understanding takes place? OR otherwise, the symbols have a taxonomy of representation in the same way as constructed language
  + Cartographers’ ‘rigorous visual grammar’
  + “cartographic communication theory (CCT), which conceptualizes maps not as pictures of the world but as a formal communication system”
  + “Meaning, therefore, is always subjective, local, and relational.”
  + “Tuftean minimalism” ha
  + Alan Watts: “the principal disadvantage of symbols is that we confuse them with reality”
  + Dominance of the visual sense
    - The visual sense offers information about surfaces and geometries, while hearing offer clues about internal material composition (one can distinguish a solid vs. a hollow object by its sound) and causal effects. If we hear glass shattering, we flinch… ***the sound simply presents itself***
  + Performance of language and artifacts -> embodied cognition
  + Data as representations
    - Reminder that most images created today have no intention to ever be seen by a human being
  + “Programming is a form of bricolage that includes tinkering, remixing, and working from half-finished examples”
  + “A map substitutes spatially for physical or conceptual territories and relationships.” —— i would argue against the continued use of the word “territory” in this case
* Ruha Benjamin
  + Empathy talk and empathy machine as a method of accruing capital !
  + “Do you need to be entertained as well?”
  + bell hooks: “Eating the other”
  + If blind people admit to seeing ravce, why do sighted ppl claim to not
  + Design thinking: in human centered design , the primary human is the one paying the bills
  + Is design still preoccupied with making people WANT things?
  + “What are the unintended consequences of designing systems at scale on the basis of existing patterns in society?”
* Office space
  + HUMANYZE token -> if this amount of humiliation is what it takes to develop a technology, is that something we want to develop?
* Based on you review, choose one idea for your Capstone
* Write a few paragraphs on how computational relationships manifest through the project idea.
  + An instrument is a device that gauges the physical properties of something; an instrument is an implement that is used for specialized work; an instrument is used to further a goal; an instrument functions to create music.
  + Sound is physics in appreciable action. The period of a vibrating wave, its pitch; the amplitude, its volume.
* If you are working with a dataset, formulate some hypotheses to analyze, filter, and explain concepts.
  + Link to geojson simplifying scripts
* Make three sketches of your capstone project.
* What are 10 relevant dimensions to consider? How might they relate to or influence one another?
  + Scale:
    - intelligibility of sound (too proximal, too durational?)
    - probably need to limit the study area based on hardware/storage limitations
  + Intelligibility/perceptual limits
  + Representation:
  + Expectations:
    - underlying associations of sound and sonified object or dimension
  + Cost:
    - if the instrument is meant to be shared and replicated, it should be reasonably accessible, financially
    - minimal computation -> is putting this in an obscure platform in essence restrictive?
    - make a flashable browser/desktop version? phone!!!! phone first
  + Storage:
    - By necessity, the data will probably need to be stored locally. How to minimize the amount of information while retaining intelligibility?
  + Processing power:
  + Tonality:
    - Should the sound be quantized? According to what dimensions?
    - May try and escape typical western expectations of 12-tet, but there should be a fundamental reason to do so (rather than “just because”)
  + Temporality:
    - Data types will be binned according to polygon, line, and point, which all have different inherent spatial specificity (“durations”)
    - How else could the relationship be understood? Sound <-> space <-> time
  + Agency
    - How can the user of the instrument easily redefine the sonic parameters to better reflect their subjective reality ? and personal experience with space
* Precedent research. Bring at least 2 projects as precedent to share with the class. These can be precedents in impact, process, or artifact.
  + Norns+shield, of course
* Start thinking about who the best advisor for your work will be.

AI, for better in this case, does enable joy and creativity in computational processes by giving the opportunity to program in non-symbolic ways. This lowers the barrier of entry to using computers for creative purposes

* What exactly is the world building exercise that the reading takes on? And your project?
  + Offenhuber:
    - Symbols =/= reality, Symbols = construction through heuristics with variable sophistication
    - How does it differ from the existing conditions?
* What models are you employing? What are their limitations?
* How would your project work in a world with no data?

“*THE MUSHROOM AT THE END OF THE WORLD”*

*Photography as world building*

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Of note for meaningful exploration:

DARK ZONES AND ISOLATION

* Superposition of human and physical geography
* Dark zones: physical constraints, financial constraints. Who is left behind? What are the driving factors of ‘isolation’ ?
* How does this compare to analog coverage? What is the disparity? How physical is this phenomena, compared to political?

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Forensis:

* “Having an axe to grind should sharpen the quality of one’s data rather than blunt one’s argument.”
* In a time when most people dying in armed conflicts die inside buildings, the city can no longer be considered merely the location of war, but rather should be understood as the apparatus with which warfare is conducted.

Excavating AI

* “This arc of inevitability recurs in many AI narratives, where it is assumed that ongoing technical improvements will resolve all problems and limitations.”
* What’s more, those circuits can change over time as the cultural context of an image shifts, and can mean different things depending on who looks, and where they are located. Images are open to interpretation and reinterpretation.
* To impose order onto an undifferentiated mass, to ascribe phenomena to a category—that is, to name a thing—is in turn a means of reifying the existence of that category.

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* *Sound wave mapping vs map sounding e.g. fluid dynamics*
* *night lights*
* *2D vs 3D*
* *Is the hardware componentc unnecessarily fetishistic?*

[*https://jamesbridle.com/works/drone-shadow-handbook*](https://jamesbridle.com/works/drone-shadow-handbook)

[*https://isohale.com/LABOR-DOMAINS*](https://isohale.com/LABOR-DOMAINS)

*=====*

Hi, I am brainstorming an audiovisual "map" interface (web to start, although I would eventually like to port it to a standalone application). My initial idea is this:

* Visualize a geoJSON of New York State elevation isolines. The map should be pawnable and rescalable to the limits of a maximum bounding box constraint
* Draw a static square “lens” in the center of the viewport
* As the user pans and zooms, count the number of isolines contained within this square lens: individual contour lines as well as the sum of their elevation values
* Depict this isoline total lens summary somewhere in text, dynamically
* Also add an audio dimension that, for now, plays different pitches based on the number of isoline features inside the lens

Can you help me get started? Please recommend some possible code libraries was can use to begin, and then we’ll take it from there. I would prefer javascript, python, or some combination of the two!

Let me know if I can clarify anything about my concept before we dig in.

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Snoweria meet:

terrain as substrate of signal

* what is heard in the dead zones

listening as a way of understanding space might be different from listening to a MAP (representations)

seismologists listen to earth - no visual access (instruments!)

what are we attuned to, sonically? what aren’t we? cognitive

alternative universe that ignore the tyranny of visuals entirely…. intuitions (accessibility concerns)

pick an activity! for next week —— when would this be useful, what do we want to do with this thing?

* e.g. legislative body

performance…….what does this challenge? existing paradigms

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Todo:

* Create Three.js or d3.js OR p5.js sketch of NYS contours
* Add towers -> need Z axis
* Add contours related to Z axis

sounds as transfer through media and substrate

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Bizarre, uncanniness of LLMs… training means the ability to make the assumptions of all possible worlds, and return the most likely combination of possibilities for the current context based on a likelihood predicated on trained instances of the same

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triangles! make triangle meshes

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* *What is your research question?*

Though the contemporary milieu of hyper-connectedness and always-online/IOT infrastructures pervade cosmopolitan bourgeois consciousness, millions in the United States lack reliable internet/cell access. What is the geography of the digital divide? What, and where, are the “dark zones” around us, as expressed through this divide?

In order to survey the spatial digital divide, internet connectivity has recently been mapped with fairly fine granularity in order to define regions as unserved, underserved, or served with reliable high speed broadband. These analyses take into account service media (e.g. copper, coaxial, optical) as well as latency in milliseconds (see:<https://nbamgis.github.io/BEAD-Location-Max-Service-Level-Sample-Notebook/BEAD_Service_Level_Sample_Notebook_No_Output.html>, courtesy of FCC/NTIA Broadband Data Collection center).

Cellular connectivity, on the other hand, is more nebulous and Current data is reliant on self-reporting from network providers, which may mis- or overrepresent the strength and extent of signal propagation in the interest of advertisement. This has compounding ramifications, including:

* safety
* public sector infrastructure development

*In practice*: How can alternative methods of cartographic inquiry

defining boundaries and space in ways that reject typical western colonial cartographies (e.g., continuity instead of parcelization, linear/non-cartesian space, alternative projections)

Alternative perceptual/sensory integrations supplementing or replacing visual dependencies

Awe; a sense of appreciation and play when harnessing and operating on data

data as performance catalyst; computation as substrate

Reevaluating spatiality in communications networks

Soothing the dissonance between virtual spaces and physical infrastructure (+ attendant systems of human labor and exploitation)

Reclaiming the deeply geographic and spatial methods in which a musician/artist/human being practices and shares their craft (How does a community “scene” survive decentralization? What is lost and gained when spatially untethered?)

Rendering the aspatial or obliquely spatial (algorithmic recommendation networks etc) into visible geographies

Rendering invisible or less-visible infrastructure visible. e.g., necessary power, server, transmitter, geological infrastructures)

Examining “DARK ZONES'': what are the physical constraints? political constraints? Who is left behind? What are the driving factors of ‘isolation’ ?

* *Which computational tools and design methods will be best used to explore your idea. How do these engage meaningfully with your topic/concept/research question. How will you explore the spatial concepts embedded in your work?*

Cartography, and specifically alternative sensory methods in the form of spatial data sonification.

* *You have also been researching projects which are precedents to your topic/concept/research question. Present projects which best show the best current work being done around this idea?*
* Add NYS broadband address maps
* Show modeled FM maps
* CellID citizen science map
* <https://vjmanzo.com/wpi/sonify/>
  + Tool to allow one to input their own data and add+explore a sonic dimension
* *Does your own project move your topic/concept/research question forward? What needs to change to move it forward and why?*

Re: digital equity and access mapping:

Precedents abound for fixed broadband access, but less plentiful for mobile services (in part because of changing reliability). How can the provision

Re: alternative cartographic methods:

* *Develop sketches for the capstone idea. Your sketch should describe what each idea might look like as a final project. Describe its audience/s.*
* Add three.js map
* Add cellID xy coords
* *Think about each project in multiple dimensions. What processes and systems do they incorporate beyond humans and computers. Since our projects all address the built environment, how does the built environment form relational systems in HCI. Please diagram your HCI+ concept.*
* Digital equity
  + Accessibility (communications)
  + Public data interfaces / portals
  + Who is left behind?
* Sensation and perception
  + Accessibility (sensory)
* Remote sensing and topography
  + Construction and visualization of contours
* Physics
  + Transmission of signal
  + Terrain and topography as substrate for signal
* Privacy
  + surveillance capitalism
  + pervasiveness of platform internet
  + “off the grid” as choice
* Ecology
  + Tower construction
* *Consider whether your project might change for a different audience. Or to put it another way, is anyone/anything excluded? What are some alternative sketches if the ideas were developed for a different audience?*
* *What kinds of data do you need to explore to begin explaining your work in.Please show your attempts at visualizing your data or making prototypes of your project.*

[*https://nbam.ntia.gov/pages/open-data*](https://nbam.ntia.gov/pages/open-data)

* *Do you need to create datasets? If so, have a first pass at creating it and discuss its completeness and use cases.*
* Extracted contours from USGS 30m DEM
* Extracted elevation of HiFLD towers from same
* Todo: model propagation areas? Similar to FM transmissions, if the physics is salient. Can be simplified
* *By now, you should have proof of concept that your data is already accessible, or easy to gather.*
* *What scales does your project investigate? Multiple scales or transcalar projects are encouraged.*
* *What is the most effective way to represent your project?*
* Minimum viable product: web application
* Ideal: standalone object for human interaction and exploration with a “scrollytelling-esque” web accompaniment/expander

Definition of an instrument:

Script gist:

Most of the last few weeks since presenting my initial proposals has been brainstorming ways to meaningfully engage with spatial communications networks through contemporary infrastructure needs.

Searching through infrastructure spatial databases and “data portals”

OpenCellID (and similar) allows one to visualize granular network data that includes relay base stations that interface with an individual device and cell tower.

After our conversation a couple weeks back re: SimCity and Minecraft, I had been thinking more about my visualization engine as effectively a video game … spatial audio traversing through a landscape.

TBD: actual audio, but

Using NYS as proof of concept; especially with the dead zones mapping bill, but since all the data is available at least at the national level with good granularity it would be interesting to target several study areas with variable levels of connectivity

Again, compare transmission buffers to the intended effect draped over the landscape

todo: multiple ring buffer to simulate contours

specifically visualize where there is “void”

signal loss, remote sensing zero, anybody home?

propagation <-> void

add link to summer site

compare propagation contours to 3D envelope vis

new york state: introducing legislation implies the situation is less bad than in other states … how to suggest improvements and similar applications (“spatial solutions”) elsewhere?

**todo**: simulate signal propagation… occlusion.

would be neat to have a random terrain as test cases for random point-signal occlusions

add mouseover behavior on spheres to unhide respective propagation curves

use noise mapping simulation as precedent example

convolution reverb… but for comms signal..

*photography and cartography you’re just showing off what someone else has made….*

*overture maps*

snoweria: what is lost when translating human-language terms and innate understanding of space to machine-readable and easily scalable, parsable numeric data

data <-> knowledge

MSF HOTOSM points of interest ……. changing

<https://codepen.io/prisoner849/pen/PoOKrPO>

isolines noise?

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Localizing cell towers:

CELLid tower location = mean location of all crowdsourced measurement coordinates. Inaccurate method because omnidirectional broadcast antennae are rare. Most output signal in a 120 deg horizontal sector. Many towers will have three antennae in order to broadcast at a full 360

Inaccurate measurements aren’t as problematic on small scale maps, but severe on large scale maps

If exact coordinates are targeted, cell pings can act as an affordable alternative to GPS alone *(published year: 2015)*

*“Remote” Sensing aka remoteness HA*

*==============*

*“*Cell phone signal strength is measured in decibels (dBm) that are received by a mobile phone from a cellular network. Signal strengths usually range from approximately -30 dBm to -110 dBm. The closer that number is to 0, the stronger the cell signal. Any signal that measures better than -85 dBm is considered to be [a good cell phone signal strength](https://www.wilsonpro.com/blog/what-is-a-good-cell-phone-signal-strength).”

cell signal test (iPhone)

\*3001#12345#\*

“Cell signal can be impeded by natural environmental barriers, including mountainous terrain or thick forests and vegetation. Indoors, common [building materials](https://www.wilsonpro.com/blog/how-building-materials-affect-cell-phone-signal-booster-performance) including brick, steel, concrete and LEED-certified glass windows can hamper a strong cell signal.

Furthermore, as the population of cell users increases, networks are becoming increasingly bogged down as devices compete for signal. That’s why you’ll most certainly experience a lag in service when you’re at a concert, a conference, or any other event where a large amount of people are using their cellular and mobile devices”

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*AUTOGRAPHIC visualization* via cell track traces - individual pings meshed through time and space to find the average location of a tower in space (think 3D convex hull look)

concept: points from single cell (ie quasi-gps) ID forming a 3D point cloud connected by proximity - as the cloud updates, so too does the ‘average’ centroid location, aka the cell tower

signal loss, echoing wavelengths, understanding contemporary signal anxiety (think john wilson tin foil ppl)

**seth**:

what happens when you lose fidelity, workarounds?

stratification of signal architecture - where does it become the built environment?

sonifying entropy

erosion, distance from effective towers

official towers vs workarounds

FCC frequency band -> power of individual transmitters important

drop it into something to model as if you’re raycasting LIGHT since it’s line of sight

if youre on megahertz range the level of absorption is extremely immediate - billboards good trees bad

overlapping bands more legible by using sound -

consonance vs dissonance based on reduction of amplification - voiding

degradation (tape-like)

harmonic series consonant at polygons of respective towers - as cell phone travels between regions and switching towers the sound will change

check out waveform residents

kunst audio (austria)

earth sound earth signal doug

energies in the arts

art and telecommunication

PAJ transmission arts journal

“sound” radio art pieces book

transmission

bruno farmheim

perspectivist…

radio rethink

radio territories

radio t(e)xto

wireless imagination

reinventing radio aspects of radio as art

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todo 3d\_vis (11/15):

* add legend w/ patches of some sort
* add toggle function to legend
* substitute better contours
* wrap polygons around contours
  + add lat,lon pair to polygon geojson that is the joined coordinate pair of the respective tower
  + use this as the ‘centroid’
* polygon dimmer mouseover function
* add slider to change stride number for polygons?
* change polygon vis to not radiate from centroid but from the tower coordinate
* viewshed analysis on tower points
  + compare FM viewshed to FM FCC contours
* Extract cell tower power from FCC data
  + <http://wireless2.fcc.gov/UlsApp/UlsSearch/licenseLocSum.jsp?licKey=12169>
  + <https://wireless2.fcc.gov/helpfiles/licenseSearch/helpCellular.html>
* <https://stackoverflow.com/questions/59163141/raycast-in-three-js-with-only-a-projection-matrix/61642776#61642776>
  + recasting with projection (but is mercator boooo)
* add graticule to just bounding box area

“remoteness”

* site unsuitability index based on composite isolation
* rank importance of different communications signals (radio wavelengths, cell generation, etc)
* distance to x in using accessibility surfaces

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Giving the same damn elevator talk for computational design as I used to for “geography”

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FCC control points? Transmitter in Rome, NY has:

500 W. Dove RD, TARRANT, Southlake, TX

P: (800)264-6620

as control point. Seems to be a verizon data center but no google maps info

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piecemeal geospatial cell fabric:

<https://community.esri.com/t5/telecommunications-questions/cell-tower-data-for-usa/td-p/234276/page/2>

* Cell signal covariates:
  + Sightlines (viewshed -> bidirectional)
  + Base station power (regulated by FCC)
  + Tower frequency (wavelength inversely proportional to the frequency)
    - 2G, 3G: 30-50 km
    - 4G: 5-15 km
    - 5G: 1-3 km
  + Land use (vegetation, water, etc)
  + Population density
  + Tower orientation, potentially? Omni- vs unidirectionality
  + Number of rainy days, annually (avg visibility)
  + Building footprint obstructions
* Physical accessibility covariates:
  + Straight-line distance to nearest populated area over threshold
  + Travel time distance by road to XYZ
  + Density of maintained roads in region
    - Fclass etc
    - Average proportion of maintained roads in study area
  + Proximity to emergency services
  + Proximity to
  + Proximity to commercial airports / air strips
  + Natural barriers
    - Navigability of terrain + rivers
  + Disaster resilience
  + +++
* Digital accessibility covariates
  + Cell coverage (+ quality)
  + Broadband coverage (+ quality)
    - Incl. affordable plans
    - DSL, Cable, Fiber
    - “Backbone” infrastructure
    - Latency
  + Satellite coverage?
    - Facilities, providers
  + Power reliability: connectivity to grid
  + Data center locations
  + Age of physical infrastructure (e.g. civil engineers’ infr. report card)
  + Disaster resilience