Traffic Report Empowers Commuters

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Two modular logics of contemporary governance. Empowerment is power to the people, is dependence on reasonable choosers who have the right and ability to get what they want. Abducting this into a broader objective is rationalization. "Each such project or strategy of rationalization … is a strategy to intervene, whether in thought or in reality, upon a set of messy, local, regional, practical, political, and other struggles in order to rationalize them according to a certain principle" (Rose, 28). To govern by freedom, empowerment may serve rationalization, as in motorists conducting their drives to minimize traffic.

In studying the San Diego Wireless Traffic Report, users participate in a kind of social play by database processing that depends upon and encourages a specific intelligence and offers several experiences of fun. The vocabulary of fun and play do not deny or replace the user's experience of traffic reports as useful in relation to their responsibilities. They rephrase and recontextualize those experiences. Playing an MMORPG, repairing a friend's armor or transporting her across an ocean are useful actions. Alternately, cooking does a useful service for others to whom one may bear a responsibility, but still, irreducibly, entails play. And if you're going to cook, you might as well try to "keep it fun."

How might we ask what users are doing when they use the traffic report? Objectively. What demographics use the system, at what times of day, along what roads, with what phones, on what computers, on whose time, to what effect? Rather than lacking something anthropological that could be added later, this approach insists on something devoutly anti-empirical. In its method, concepts categorize contents; plans

prescribe possibilities; what is found becomes a new instance of what is known. Yet, the actual question is how to *witness* the environment and practices in question (Lynch, 52-53). Objectivity strikes a confident and modest distance (Haraway, 25-32). A second answering of what users do: as they see it. There is not one commuter tribe who uses the service. There are many drivers who call in, many callers who talk to their friends about it, many friends using other systems instead of this one or in addition to it. Likewise, users do not just see the system, because they also feel it and talk to it, drive it and plan with it. And, finally, because they are also logged by it, talked to by software, served query results, discussed by designers, stored and backed up as profiles and commutes.

Instead of the modest objectivity that already knows or the cultural subjectivity that sees but is not touched, this study enacts empiricism as "a method of inventivity, the invention of concepts as objects of an encounter, a here-and-now encounter which produces ever new, ever different 'here's' and 'nows'" (Rose, 12). Empiricism is not marking tallies within categories so much as a vulnerability in concepts. The sensitivity of thinking to what is studied. And this project does not understand a delimited object of study. It dwells on a macro-actor, an assemblage, which is a network beyond any one metaphor. "It is at the same time machine, market, code, body, and war" (Callon & Latour, 294). It is many parts and has many wholes.

What is "the system"? Where does it end, what is the character of its substance, what are its functions, what are its formations, what is its network? The San Diego Wireless Traffic Report is run by designers, engineers, a public and development server, database and speech recognition software. It's put in motion on the roads by email, website visits, text alerts, phone calls, drivers and spouses. For drivers it's a service and a way of knowing, for students who work on it, it's a researcher's project they put time into. For

local government, it could be a useful asset, for the designer it's a project without enough users, for those we asked to try the system, it's a complicated and useless gadget. For a student working on the traffic system, it's "a good way for users to know their best times to travel," "it's a good way to optimize" their commute. A useful service.

Empowered gaming

What is a game? A minimal, though imperfect, definition of a game states simply, that a game is "a series of interesting choices".[1] Though some games of luck, e.g. Chutes and Ladders, give players' no choices and many times a series of interesting choices is not a game, the definition suggests a direction to look or a motif to notice. It prepares perception, installing in it an ordering: series of interesting choices. There are some other things to notice in most games that diffract a telling pattern through traffic report users. Games are things people can usually get better at, might win, and constantly avoid losing. Mastery, victory, and evasion. Sometimes games are even fun.

Games provide affordances and constraints. Things players can do and things they have to deal with (Mateas, 25). In Rock-Paper-Scissors, your affordance is choosing a throw, but constraints insist that scissors must be beaten by rock and throws are only made on the count of three. Balance between affordances and constraints should give players a sense of effectance. "The desire for competence and feeling effective in dealing with the surrounding environment" (Buckles, 37). The feeling that you can get things done. A kind of empowerment, which must entail objects (to deal with) and a vehicle of player agency (the thing that does the dealing).

[1] Sid Meier, quoted in Rollings and Adams: 2003, p. 200

Despite its ubiquity as an activist call for self-enacting social justice, empowerment demands a localized power relation of violent phallic power. Empowerment tries to found power inside, as a capacity of autonomy and freedom. Unlike re-imagining agency, empowerment may not make it to the site it would like to be found. In the site of empowerment (women, drivers, Africa) must be the will that wills. *It* takes action, everything else is merely motion. In this ability of freedom is a denial of inabilities, through a mandate of overcoming or by letting the unfit quietly decline the offer of empowerment. This freedom cannot be benign, because it chooses from options, does what it likes with what objects surround it, is nothing but one half of a bifurcation of the possible activities of combinations of bodies. When a gamer plays the game, we say that they are free and the game system is an object for their freedom. A constraint to their freedom, or an instrument affording them action. A tool for the user's discerning action.

This empowerment is basic to the traffic system's users. And they are right: the system *can* empower a kind of *user*. In our experiments, initiating users to the system tended to fail. They had no options in their commute or didn't drive a regular one, weren't skillful with a cellphone while driving or didn't care about traffic, usually took a bus or didn't know where exit names on freeways were located. But for those engineering and regularly using the system, it would be preposterous to suggest the system isn't instrumental. As the lead researcher told me, "I don't think people call it just for fun." The service should be used by everyone driving a commute. Alas, it should be used by everyone driving a commute with options about timing or routes … who's comfortable calling the service, knows what to do with the information, and will voluntarily use it again. The tool, then, has users, but also makes possible an extremely

narrow user identity which must then be appropriated by the situated action of those who, in mastering a use of the tool, are also thereby directed by it.

The system processes

A database, queried by a server, generates "real-time" traffic information. A succession of digital audio recordings speaks through a virtual phone service to human users whose talk can be recognized by speech recognition software running on the same server. It runs queries on the same database, adding records on the database.

The system's design was centralized, but not in a corporate way. Its production was not tightly scheduled. There was not top-down planning to tell those working on it what it would look like when it was finished. It was not run past the marketing department. Instead, it is, and has been, put together by a researcher and his student workers, who are charged with tasks or develop their own expertise for the project. Students communicate with the lead researcher largely by email, and take on the work out of their own interest. They are learning and not subject to the same standards of professional responsibility as most corporate workers. As a University of California project, the service cannot pay or charge users. It cannot stimulate its user base by money and it cannot collect money to purchase private traffic data. Nevertheless, for the database to remain useful, data has to come from somewhere, has to be generated, must always be fresh for new results to be drawn from it, so users can traverse it (Manovich).

Caltrans, California's Department of Transportation, collects speed measurements from sensors built into 70% of its freeways and makes them publicly available online, mostly for free, updating in real time (CWWP Information). Some sensors, placed by private contractors, do not report data for free. Additionally, 40% of all the Caltrans loop

detectors are nonfunctional on an average day in 2005 (Rajagopal). San Diego Wireless Traffic Report scrapes[2] this information, updating its own database with this, and serves processed information out by email, a website, calls, and text messages. Most traffic services scrape their data from Caltrans, because the data is free, authoritative, and updated very often (between 20 seconds and a minute, depending on the Caltrans district). This is the database's representation of traffic, a series of numbers at particular sensor locations along particular freeways.

Pictured is a double loop detector installed on a California freeway.
A single loop detector would look like just the top row.
Photo: Bill Stone/PATH

Speed data is an average of differences measured by loop detectors that work like big metal detectors. The sensors only measure the number of things that pass them and

[2] Although scraping technically refers to obtaining data without access to the database or formats the data originally appears in (as in taking screen shots from a web browser), and is in a sense non-consensual, the Traffic Report developers used the word despite, apparently, obtaining their data quite legally through one of Caltrans' free services for traffic report systems.

how long things take to pass over. Total time occupied divided by number of times occupied imagines an instance of the equal distribution of the one thing the detector can feel, its occupancy. This data requires another variable (called the g-factor) that would include an estimate of vehicle length and the size of the particular detector. Vehicle length varies by freeway, lane, and time of day. Truckers drive different roads at different times and tend to stay in different lanes, often restricted to the right most two lanes. Commuters using the system tend to drive cars and can use all lanes of the road. Either using a constant g-factor, or one calibrated to the particular detector, multiplying this with the number of vehicles, and dividing by the average fraction of time they occupy the detector yields a traffic speed (Chen). By means of the g-factor, average occupancy becomes an average rate of distance per unit time for movement on the road. A statistic, an interesting number.

Processing this abstract speed measurement, which is not the speed of any particular lane or vehicle, the distance of a commute divided by rate becomes time. Estimated travel time: the length of time the speed of the road takes to move somewhere. Sensors are located in the Caltrans data set only by county, route and postmile (CWWP Information). As data, freeways are segments with exits in order (each exit has a sensor), and sensors at distances. Neither coordinates nor a map stabilizes them. A student worker on the project puts exit names in the right order (with the help of Wikipedia) and finds coordinates for each exit, pinning down the one abstraction, of segments with exits at points, to another abstraction, a two-dimensional coordinate space.

In the database, every entry is unique and defined only by its relation to others. Items go in unordered lists that must be located by their relations and contents. Relationality defies the primacy of any one relation. Exits relate to names as well as

unique identifiers as well as distances as well as sound files. Relational databases make it easier to manipulate and recombine particular data locations. A user is not just defined by their last name, but also by their email address and phone number. However, there is a master variable for the user's identity: the user ID. User ID's, unlike names or commutes, are assigned to each new user profile so that there will be no repetition or confusion over who a user really is. The user's basic profile, contained in one table, consists of a unique ID, an email address, first and last name, a password, cell phone carrier, and phone number. As described in ISO's security standard 27001, "all users … should have a unique identifier (user ID) for their personal and sole use, to ensure that activities can subsequently be traced to the responsible individual" (Donaghadee). Similarly, a password functions secondarily to prevent identity theft or keep secrets. It also keeps the user's configuration and information editable through the password, when using the expected browser interface. It separates and maintains users on the website. User profiles are associated with a morning, evening, and alternate pair of commutes, each understood as segments with onramps and offramps along particular freeways.

Unlike some other forms of management through databases, the system is voluntary and more a positive extension of identity than a reductive redefinition. Users are not turned into user profiles, though they are treated as profiles. Non-users do not have profiles and only appear in the database as traffic slowdown. As objects against which empowered users are afforded action.

There is another kind of ghost of the user. The developer testing the system. To maintain the system, changes are first made on the development server, which runs separately from the public server on its own public, but secret, website with all the same

basic capabilities as the public server. Changes must be tested here, lest they fail and the system be wrong. By calling into the development server himself, a student testing the system can check its report against other traffic reports and websites. The system has gone back and forth on many design details, responding to user feedback and concerns of the designers.

In testing the service, the student worker counts as a user and other reports of traffic (mostly using the same Caltrans loop detector data) count as congestion itself. Most people who use the service are not like the student worker, are not imagining traffic the same way, accessing the system the same way, or concerned with the same details. Likewise, they are on the roads and not just comparing the information served with other traffic reports. They are trying to save time or figure out how late they will get to work or home. How is it possible that the abstract speed measurement provided by the database and the method of testing the system that compares it only to other traffic reports can provide useful traffic information for particular embedded drivers?

Drivers that use

Though the system treats all users as instances of the user ID variable, personalized in the sense of having a complete table of profile and commute information, users do not experience themselves as user IDs and do not have to. Segments with points that are exits and sensors become, for drivers, highways and freeways with merges, bypass lanes, interchanges, construction, and side roads around the mess. No longer one dimensional, exits become non-Euclidean. Avoiding traffic is passing slower cars, driving obscure roads, commuting at different time of day, talking with friends about traffic, trying out XM or Blackberry traffic reports, coordinating with

spouses and children, and calling the Wireless Traffic Report. Use of the system is part of a complex driving experience. Instead of a structure that is invariant across situations, users take part in "processes whereby particular uniquely constituted circumstances are systematically interpreted so as to render meaning shared and action accountably rational" (Suchman, 67). If it were not for this situated interpretation of the traffic service, its data would not be actionable by drivers. However, if it were not for the unreliability and particularity of these processes, the system could be useful for all average commuters, could rationalize rush hour traffic. This is not a paradox, but an enabling valve on the system's usability. Not everyone equally, but still some can play.

To play, there is a particular form of intelligence empowered by the system that is specific to this form of activity. Intelligence has many meanings related to training and measurement, and the panoply of cultural resources for understanding wisdom, cunning, savvy, cleverness, resourcefulness, sharpness, wit, braininess, knowingness, intuition, ingenuity, and smarts attests to its multifarious ambiguity. We live out these contradictions everyday: is it smarter to answer a tough question correctly or remain silent and see what others have to say? In what sense are those with high Intelligence Quotients more intelligent? Overlooking brains and other anatomy, particular forms of activity diffract particular intelligences. In the trains of the London Underground, "the practical intelligence relied upon by drivers in operating a vehicle is embedded in a socially organised body of practice and reasoning which informs the very ways they perceive the traveling public, and recognise and respond to contingencies and problems which inevitably emerge with the operation of a major transport system" (Heath, 557).

For users of the traffic service, intelligence makes possible something less rigid than the enforcement of rules or the formation of a system. Socially organized practices

of commuting feature an intelligence that exceeds its structuring. Intelligence does not just observe principles for driving, and it is not a set of elaborate feedback mechanisms for managing rules. Rather, it maneuvers between rules that may be broken, tendencies that may be goals, side-effects, or waypoints on other routes. What did you like about the service? One interviewee explained,

> It was real time, or as real time as you can get. It enabled me to get the information I needed while I was on the move. So, I guess the other alternative might have been to go log into some website and sit there and take a look at what the traffic was and make my decisions accordingly, but there's actually been many times when not only will I check it in the morning, just as a matter of routine, and in the afternoon, but as I see things developing and congestion increasing, I'll literally be trying to make decisions in real time based on the best information I have available.

This intelligence is mobile. It synthesizes data from many sources. It operationalizes to avoid congestion. It theorizes traffic buildup and behavior. It outsmarts random chance, which is its absence. It weighs options. Although most drivers don't call the system, and many might not check any traffic reports, users we interviewed considered this unimaginable. Not to check on the traffic would be stupid. A person who doesn't check traffic "just throws the dice and leaves it to chance." One user explains his timesavings,

> I'd go so far as to say it's five, maybe even ten minutes, by making smarter decisions as opposed to having no knowledge at all and just plowing home on one route every single [inaudible].

By checking in on the abstract speed measures and time estimates served by the traffic report, this form of intelligence can make informed decisions about how to avoid slowdowns. Another user explained his effectance, as a driver with "this feeling … there's this congestion, but I beat it. I'm smarter than everybody else!"

Smarter than everybody else. For game designer Raph Koster, this is the essence of fun in video games explained in his *A Theory of Fun for Game Design*.[3] Fun is the sensation of nearly understanding, but still not simply mastering, a pattern. Tic-Tac-Toe is fun until you figure out the whole game. Action games are fun as long as you think you have a chance and until you are so completely in control you lose interest. This is different from the "flow" model of gaming where challenge and mastery are in a perfect match (Csikszentmihalyi). Fun as understanding a pattern can include the boring parts of a game, the grind of placing a call, of waiting to see what happens next. The thrill of being in the flow, in the perfect balance, is much more rare.

The fun of mastery is not the same for everyone. Many people are simply not interested in mastering formal systems, and even fewer are interested in most particular games. In *The King of Kong*, we see players who only get serious about enjoying a game when they have so completely mastered its patterns they are in a position to get a record breaking top score. System users had more mundane standards for mastery, trying to make "smarter choices," not break all-time records.

But basic to the system as a broadly distributed form of activity is a more common American kind of fun. Cruising at 65 or more miles per hour. For traffic reports, this is the structuring absence of all traffic avoidance efforts. Congestion means stops, slowdowns, stop and go, or just a lower speed. Avoiding congestion, with its breaks and unevenness. "[S]moothness is always an attribute of perfection because its opposite reveals a technical and typically human operation of assembling," whereas "speed here is expressed by less aggressive, less athletic signs," becoming more spiritual (Barthes, 89). That the smooth consumption of freeway in modern automobiles could be so

[3] The generalized types of fun discussed here are covered in Koster's chapter five and six.)

enjoyable is a provocatively rich mystery. As one interviewee intoned about the system, "it seems so … so useful for the average commuter." A universalizing vision of total commute drivers, in their variety, divided by their quantity into an individuality.

Yet fun is not just personal, let alone selfish. Many users emphasized that the service worked for them when it meant they could be on time to pick up a son at high school or let a spouse know when to expect them. While play is always social, in this case it very often takes place between one person and a machine, depending "in essential ways upon its material and social circumstances" (Suchman, 50). This play is social not in the sense of being between players, but in its orientation towards personal social connections. These intents "neither determine the actual course of situated action nor adequately reconstruct it" (Suchman, 3). They contribute to the meaning-making of actors who can draw on plans but are never simply executing them. This play is for others: to pick up her, to arrive when I should, to see him, and to avoid them.

Another form of social fun is social status fun. The fun of seeing someone you mentor succeed, or the fun or helping others (Koster, chapter 5). Though users did not comment directly on this kind of fun, it does seems that their depiction of intelligence as the overcoming of randomness is fun with social status. The status of all non-users is that they are slowdown. Users are empowered to beat them at the commute, avoiding slower routes and times. Rationalization calls for minimum congestion, to reduce commute times and emissions. Empowerment allows individuals to be entrepreneurs of their own lives. If everyone had equal access to traffic information, or were redirected accordingly, it would ruin this part of the system's fun.

Rationalizing driving

Users seemed comfortable interacting with the system as an electronic service, as an email or a text message, as a nonhuman voice on the phone, as a graph or series of numbers. This affordance provides them the opportunity to be a human interpreter, and not just their own chauffeur. They are an empowered driver, doing the best they can with abstract speed measures and incident reports, against the odds, to beat traffic and save time. This definition of the human as intelligence against the rules of the machine, a central conceit of computer games, would be lost if the service provided a human operator who advised callers on their best route. Help avoiding traffic could take many forms.

Some amount of variability appears clearly in recent traffic services. There are changes in the medium of traffic reports, on AM and FM radio, then on the phone or web, and now also on XM and satellite radio. Sources of traffic information have changed too, at times including helicopters, news networks, Caltrans sensors (single loop, double loop, and experimental microwave sensors), caller reports, Caltrans incident reports, camera information, and other privately supported sensors. Delivery mechanisms: a radio in the car's dashboard leaves a driver's eyes on the road, except for selecting the station and changing the volume. Mobile personal electronics, such as phones with calls and text messages, or with web browsing or specialized applications, make possible individual delivery without in-car installation. Hands-free devices extend the alertness and maneuverability of the driver. Personal computers are another common means of delivery, used usually before getting in the car and useful for giving rich graphical displays with the full set of affordances to mechanical interactivity we've come to expect from web browsing.

But these changes alone cannot deliver a vision of an ideal, or even clearly improved, service. Would it be best to get traffic data from all Caltrans sensors and a news network delivered in an audio format through the car's audio system, and how would the types of information be combined? Or would a monitor in the steering wheel cycling through live images from traffic cameras be clearer? Because the traffic data reported by sensors is a statistic to be interpreted in the situated action of particular users, and not a description of any actual car's speed, the question of what an ideal traffic report would look like is necessarily an inquiry into what would be useful to its users, and therefore also of what users would be made possible by such a tool. In their own efforts to rationalize traffic information, a Caltrans grant to PATH has made possible the PeMS (performance measurement system) that refines sensor data and records historical traffic data to predict future congestion (Chen). This system is part of a broader re-imagining of traffic into the terms of computer science that promises to rationalize it into a predictable inevitabilit. But it is not a service for empowering commuters, and is therefore a project in reformulating the logics of governance, rather than realizing them through user action.

A rationalization of envisioning traffic might not be in harmony with the empowering user-centered approach of the San Diego Wireless Traffic Report, but their interoperability, at the level of software and political disagreement, evidences a discursive constellation by which the average commuter can be served.

> Political rationalities are discursive fields characterized by a shared vocabulary within which disputes can be organized, by ethical principles that can communicate with one another, by mutually intelligible explanatory logics, by commonly accepted facts, by significant agreement on key political problems. (Rose, 28)

That the one service can draw on the other, that both can helps Caltrans, that data could flow so easily between them. At the same time, the PeMS system does receive Caltrans funding, whereas the Traffic Report does not. Their scale of management is different, and their practices with commuters are very different. In this sense, both rationalization and empowerment, as 'contextures', centrally depend upon "instrumental complexes that "afford" them: they lose their specificity when treated as historical ideologies divorced from concrete arrangements of bodies, textual surfaces, lines of sight, and fields of technical action" (Lynch, 56).

Since good public transportation may never come to most of California, empowering users is crucial to governing through freedom, and this governance might not come from on high with state or federal action. However, we can sense it already in the service model of the San Diego Wireless Traffic Report. Computer science for traffic does not just mean refining and processing data for prediction, but also means making an offer of empowerment to interested commuters, to the obvious benefit of a region's average commuter. In this tool's creation of a user, with a particular intelligence, desire of effectance, and habit of fun, we should not forget the instrumentalization of users for contemporary logics of power. Empowered choosers are basic to decentralized governance beyond public, bureaucratic, or democratic state power. As the student worker I interviewed explained why the system is being developed, "it seems like just a great resource for the community to use and possibly help everyone in general reduce traffic time and congestion, which is a pain in the butt for everybody."

In summary, the San Diego Wireless Traffic Report is a system enacted by users, which it cannot but configure, and may empower. That empowerment is of and depends

upon a particular form of mobile intelligence, counter-defined by randomness, that synthesizes data and, weighing options, operationalizes to avoid traffic. Available in the activity of checking the traffic report is a social form of play, whose affordances and constraints secrete an effectance notable in interviews conducted with regular users. This play of driving, play with the rules of driving, play informed and play pursued by those who become users of the system also habituates fun. Neither this play nor its fun is selfish or indolent, but optimization-oriented. A kind of play "more and more linked to broad social structures of control" (Galloway, 76). (The point of this study is not to agree or disagree with that logic by which those who do not check a traffic report are irresponsible, only to identify the imagination out of which this statement might emerge. Could this sense of irresponsibility be used to expand the user base of a traffic service?)

The kind of mastery offered in the game of traffic avoidance, which promises to save the smart driver what may often be a significant amount of time, may be supplemented by the fun of cruising on the smooth ride of a modern car on a well-paved freeway. Opposite this fun is the stress of stop and go driving, which can also be avoided by navigating traffic well. Just for playing, though, the player has evaded blind luck, and, in this sense, has their commuter cunning confirmed without it being tested. The overall effect of this empowerment of drivers, which may often save no time and may help no deserving child lingering after school or spouse waiting at home, also strategizes toward a rationalization of private transportation.

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