R1

Open Rio

by Afian Anwar

PROJECT DESCRIPTION

OPEN RIO

Open Rio is a proposal for a physical digital intervention that visualizes and maps the interactions of visitors to favelas in real time. It provides a way to track the paths made by different people as they explore the favela, and overlays this information with data on events (e.g. parties, or happy hour at bars) and the GPS traces of community police forces as they patrol the favela, thereby providing a real time snapshot of where visitors in the favela go, what they do, and the relative safety of their environment.

CHALLENGE: BRIDGING THE FORMAL AND INFORMAL

Rio de Janeiro is an amazing city, but it is also a city of stark contrasts; it is not uncommon to find ultra-modern high rise apartments next to beautiful beaches overlooking informal settlements, or favelas. Although people living in these favelas readily integrate with the rest of the city, the same cannot be said of Rio's middle and upper classes, who still shun the favelas because they are perceived as dangerous and unsafe.

While this was true for most of Rio de Janeiro's modern history, the Brazilian government has in recent years successfully pacified the favelas and restored security, particularly in smaller favelas such as Santa Marta and Pavao Pavaozinho. However, the often misleading perception of favelas persists, and overcoming this bias represents one of the greatest challenges in bridging the formal and informal parts of the city.

OBJECTIVE

Despite the notoriety of favelas, one group of affluent Cariocas (Rio de Janeiro residents) remain undeterred. These are the foreigners, typically from the United States or Europe, who are either expatriates working in Rio or visitors living there in the short-term. Having arrived in Rio in large numbers only recently, this group does not share the same preconceptions of favelas held by their local counterparts, and for many of them, the recent pacification and subsequent gentrification of favelas and their surrounding neighborhoods have made these areas desirable and hip places to live, work and play in. This effect is even more pronounced in the smaller, more well known favelas such as Santa Marta and Pavao, where massive public infrastructure improvements in water, sewage, electricity and even wifi connections have been made ahead of the 2016 Olympic Games.

How can we open up the favelas and integrate them into the wider urban fabric of Rio De Janeiro and encourage people to visit, explore, and interact with favelas and their residents?

In these favelas, tourism and local commerce (e.g. favela tours and parties) have quickly replaced the previous commercial activities and it is in these favelas that we intend to first implement Open Rio. It is intended to demonstrate to the rest of the world that these areas are both safe and accessible, shown by the real time trails made by visitors as they explore the favela.

STRATEGY

Open Rio works by changing peoples' perception of a place by providing them with open access to information. At present, most people in Rio perceive the favelas as a blank spot on the map. They do not know what goes on in the favelas so even if conditions improve and they become safer, their negative perception towards favelas persists. But with OpenRio, as people explore the favela, their paths through the favela will be displayed on a digital map for all to see. Over time, new paths are created and old paths fade away, sending a strong message that not only are certain routes through the favela popular and well traveled, but when combined with information on police patrols and real time events, that these routes are both safe and interesting.

(Previous page) Favela Pavão Pavaozinho, example of small (less than 2,000 residents) favela that is safe and ideal for the immediate implementation of Open Rio.
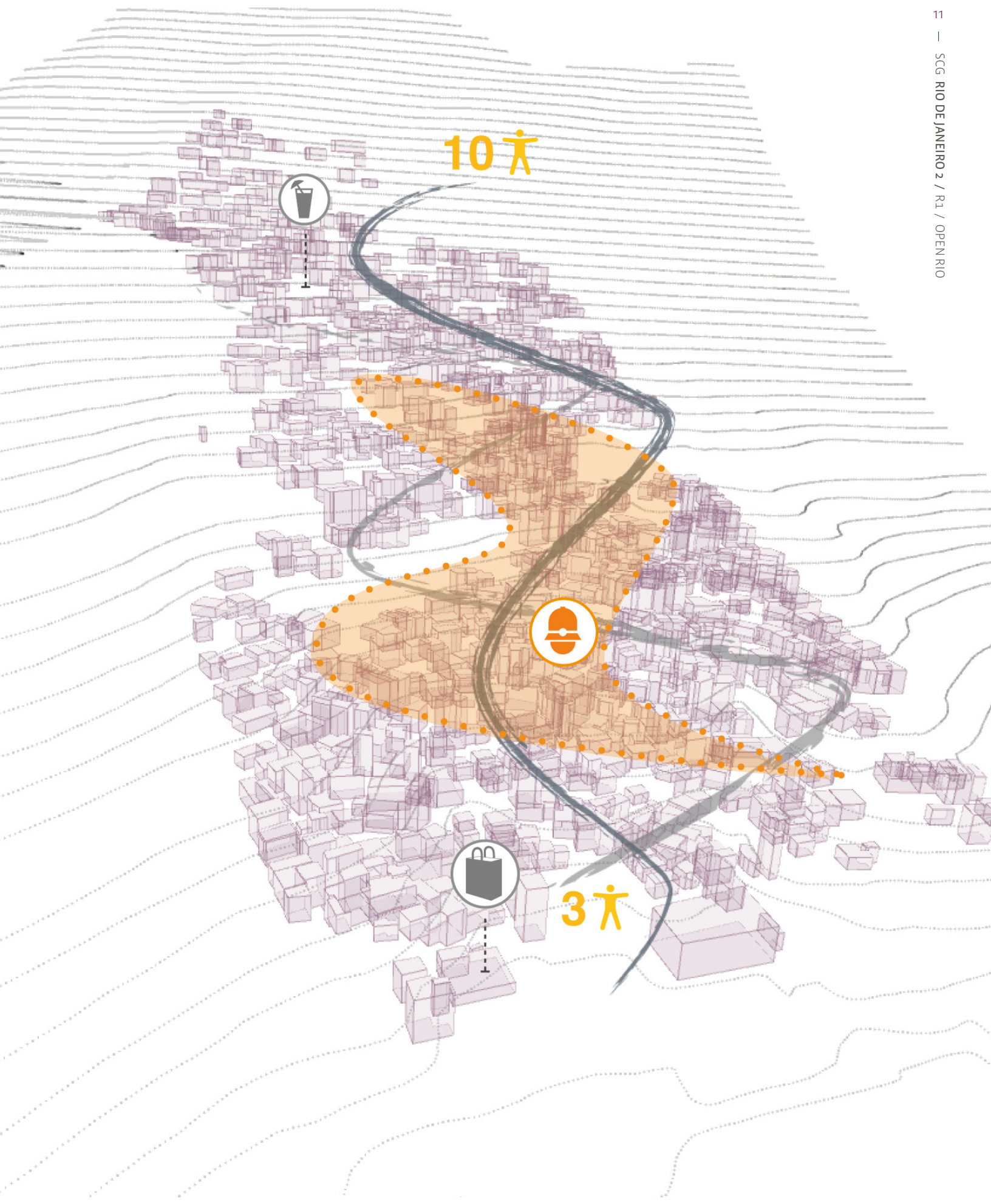
TECHNOLOGY DESCRIPTION

Open Rio uses two unintrusive methods to locate and track the positions of smart phones (and their owners) as they move within the favela.

The first method uses the Open Rio smartphone application, which records the user's GPS location in the background and uploads this data to a central Open Rio server for processing and analysis.

The second relies on a passive network of wifi access points located throughout the favela. In favelas such as Santa Marta, government authorities and community organizations have set up free public wifi throughout the favela. When connected, each smartphone provides the router with a unique device ID, a timestamp and the anticipated data transfer rate (which is represented as signal strength), which when properly calibrated, can be used to infer how far the smart phone is from the router. If all the routers in the favela are correctly synchronized, the wifi connection can be "handed off" to one another resulting in an uninterrupted wifi connection as the visitor moves through the favela.

By connecting these wifi access points together in a distributed network and sharing the data each router collects online in a shared database, you can use triangulation to infer specific trajectories taken by each person with a smartphone through the favela. By cross referencing the device IDs in the database, you can distinguish paths made by regulars (whose devices appear daily) and visitors (whose devices appear infrequently).

The paths made by visitors can then be visualized on a server-side generated map, with popular paths growing in size and intensity as more and more people use them while less popular paths decay and eventually disappear entirely. In this way, a crowd sourced map of the unofficial routes and off the beaten tracks is generated, helping people navigate and guide them to destinations of interest.

Popular paths grow in size and intensity while infrequently used paths decay and eventually disappear entirely.

You decide to visit Favela Santa Marta and have a Caprinha at a bar located at the top of the hill. Because it is a nice day, you decide to walk up the hill instead of taking the tram.
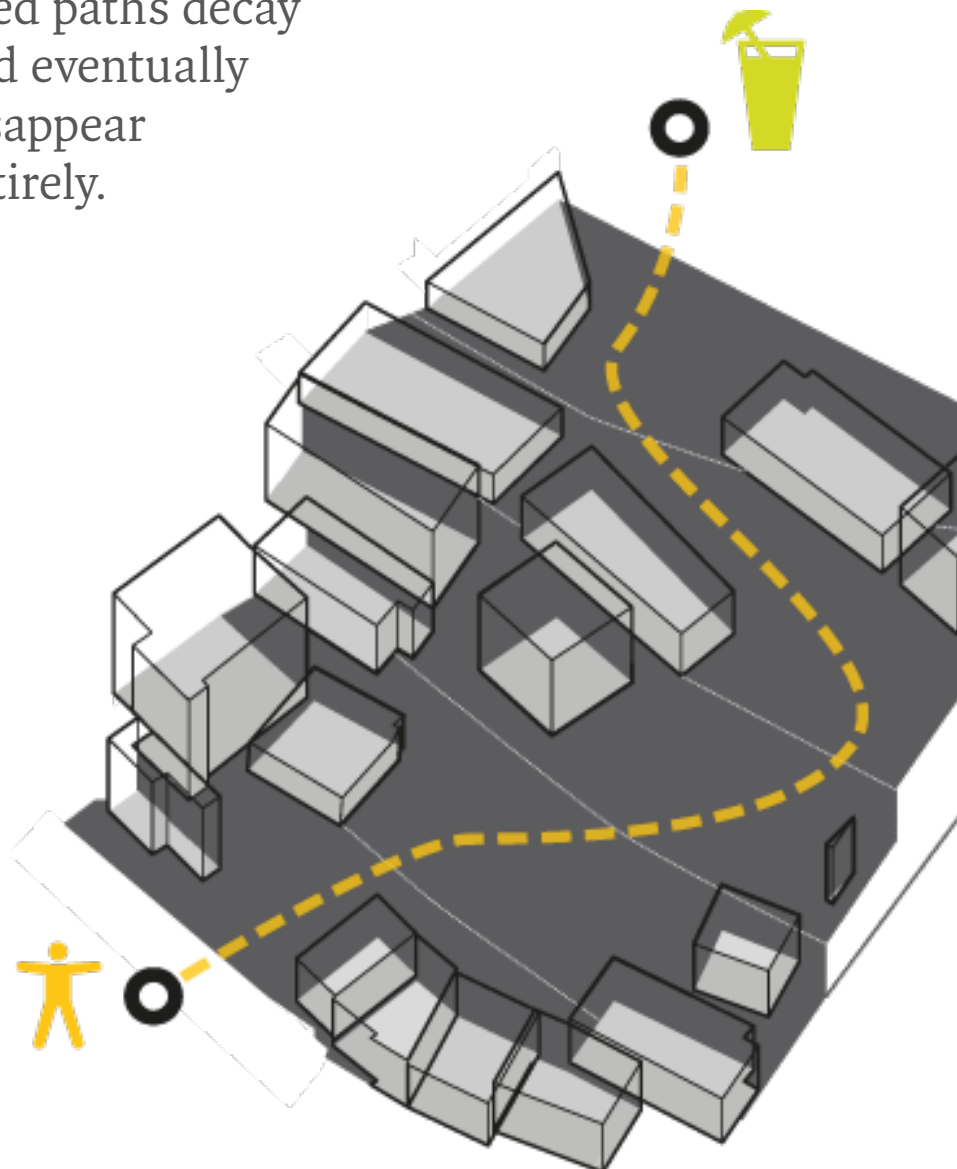
As you walk through the favela, you decide to share your location and the path you take using the Open Rio app. The app retrieves your GPS location in the background and uploads this information to a central server for post processing.

Open Rio
Server
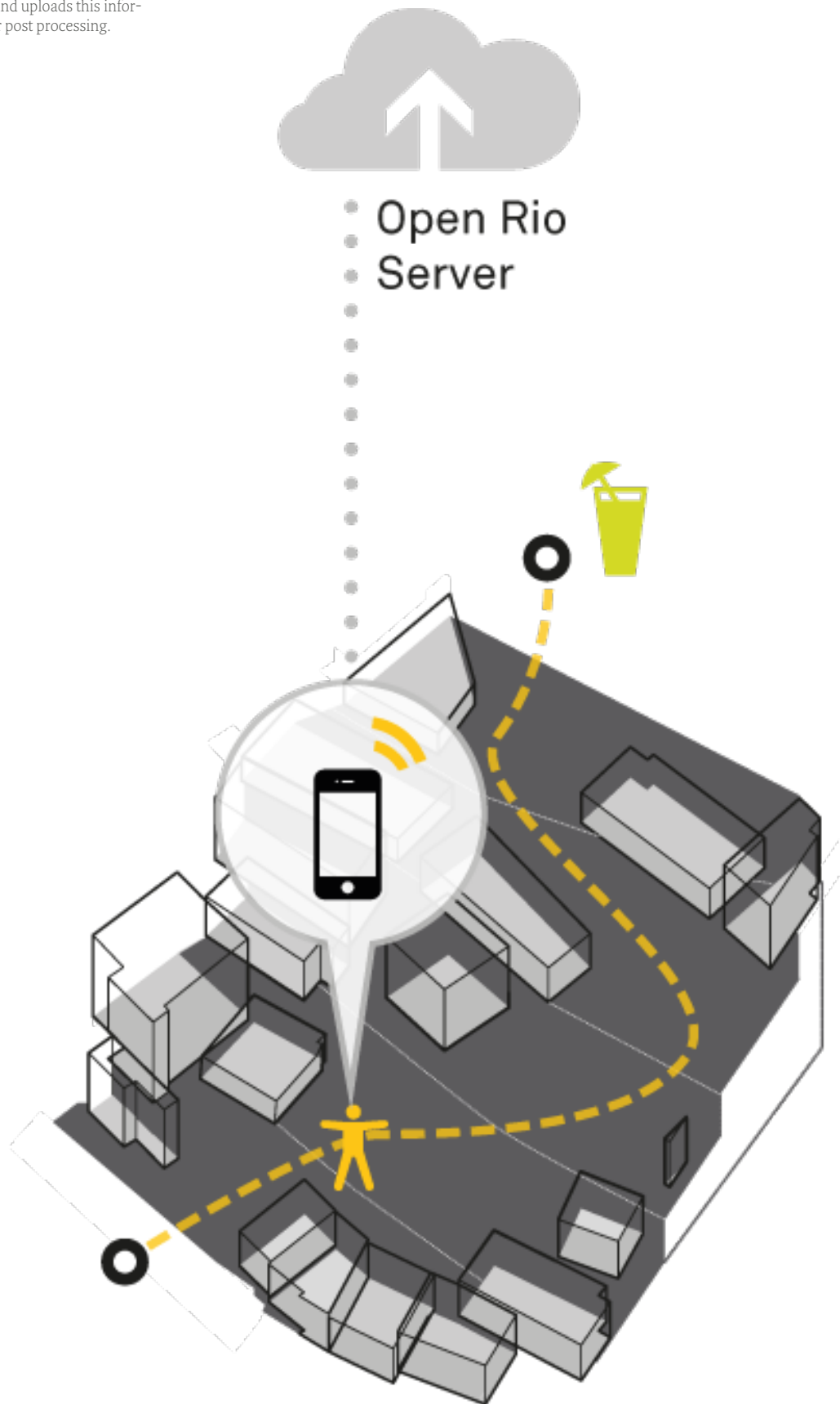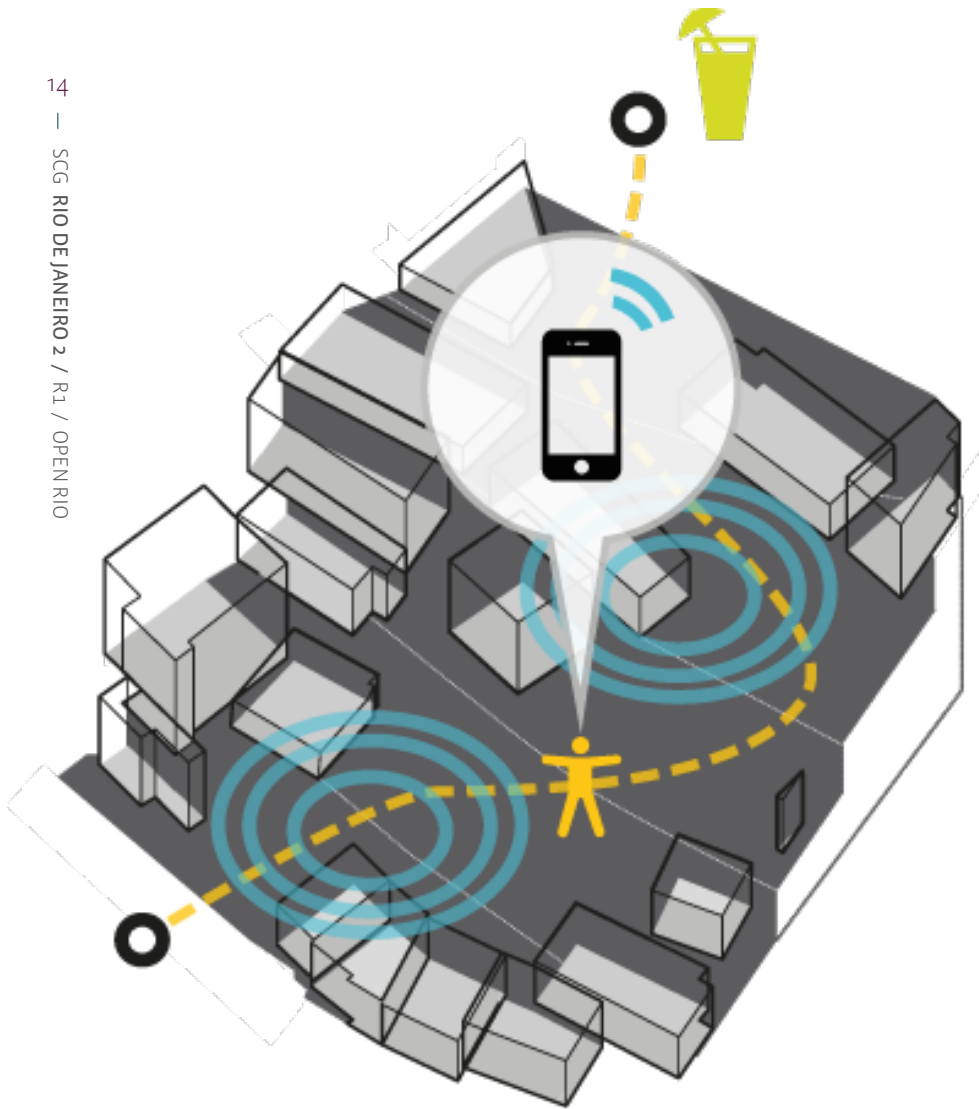
If your GPS reception is poor or you do not have a 3G data plan in Rio, you can switch to wifi and connect to any one of Santa Marta's free public wifi networks. When you do so, your smartphone shares important details with the wifi router such as signal strength, device ID and a timestamp.

Open Rio
Server

This data can be collected by individual wifi routers and uploaded to Open Rio's servers in the cloud. Using the principle of triangulation, the path you took through the favela can be inferred and cross referenced with the paths taken by others.

Open Rio Server

The Open Rio server is essentially a database that associates unique smartphone device IDs with the paths taken by their owners. By distinguishing between smartphones that appear regularly and those that appear infrequently, you can differentiate the paths made by people living in favelas from those made by visitors. It is the latter group that we are interested in.

The Open Rio server keeps track of path popularity (how many people use it per day) and frequency (when was the last time someone used it)
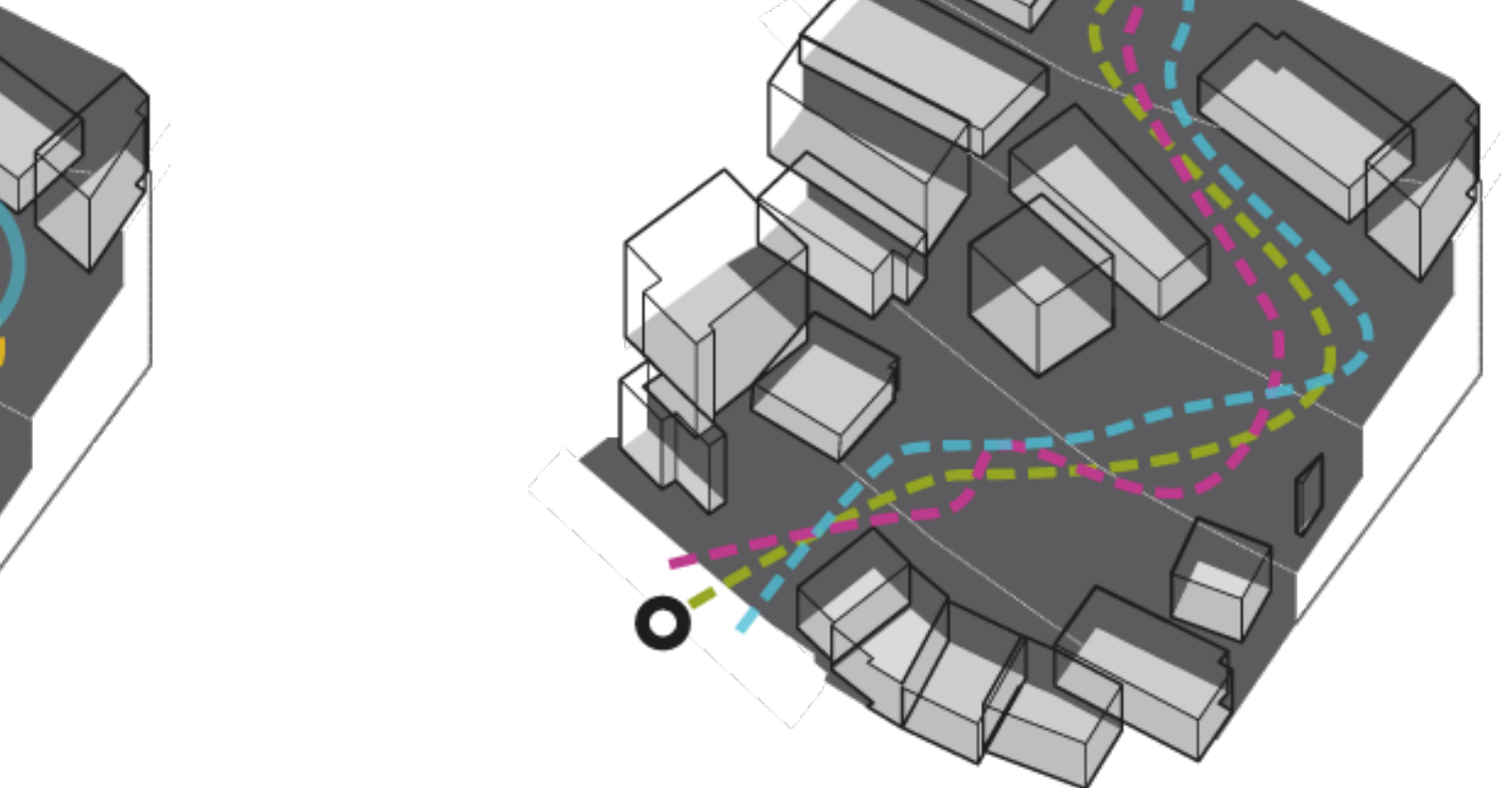
The end result is a dynamic map of the "elephant paths" made by visitors exploring the favela. Paths grow as more people use them and shrink with disuse. You can choose to follow established routes or if you are feeling adventurous, try a less well traveled (but perhaps more interesting) route.
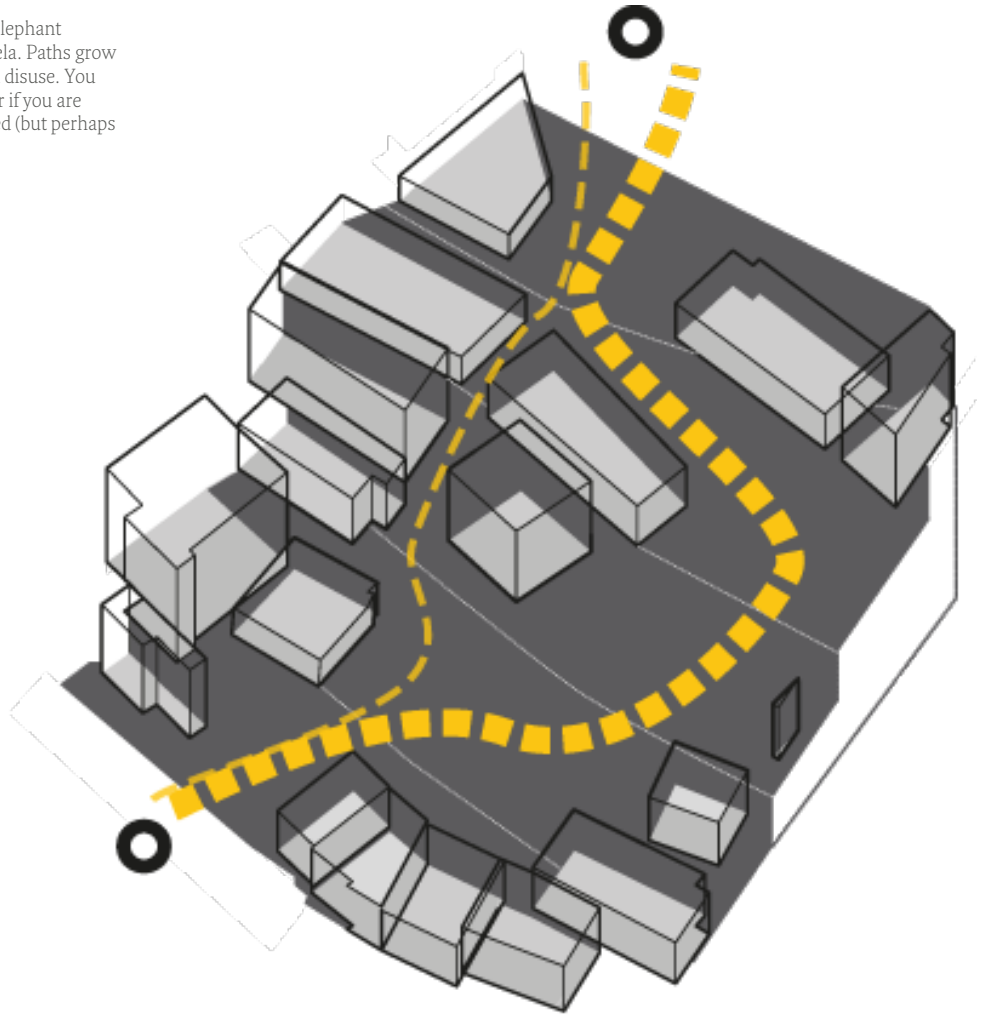
URBAN INTERACTIONS

The Open Rio map for each favela will be displayed prominently at its entrance, inviting visitors to enter the favela and explore further, using the trails of previous visitors as a guide. The real time nature of Open Rio rules out the use of static displays, so we instead propose using the façade of the favela as a digital canvas on which to project our map, thereby giving both residents and visitors a real time snapshot of pedestrian movement and interaction throughout the favela.

High resolution projectors linked to networked laptops will power these displays, with the laptop syncing with the Open Rio server to update the map in real time.

The goal of these public displays is to reach out to the people of Rio and encourage them to discover the favela for themselves by making their own path on the map.

PERSONAL INTERACTIONS

There are three use cases for personal interaction with the Open Rio system.

The first use case is for navigation within the favela, which can be difficult if you do not have a 3G data plan or a GPS device. Almost everyone however, has a smartphone with wifi connectivity, and when connected to the free, pervasive wifi network in the favela, the Open Rio app on your smartphone will use signal strength data from the nearby wifi access points to accurately triangulate your position, and guide you to your destination using the paths created by previous visitors.

You can select paths based on popularity or estimated travel time, so if you are feeling adventurous you could choose a quicker, but less well traveled path over a more popular but longer route.

The second use case involves enhancing your trip through the favela by using the augmented reality capabilities of the Open Rio app to see a digital overlay of the paths generated by users that you can either choose to follow or ignore, blazing your own trail for others to follow.

The third use case is via the Open Rio website, which allows you to post geotagged event information or annotate your trip through the favela. The website will also allow you to browse the (anonymous) paths created by others, and see how these paths change over time.

AFIAN ANWAR

Afian Anwar is a graduate student in Civil Engineering at MIT whose research interests lie at the intersection of computer science, transportation and urban planning.

His most recent work involves building a real time control system to algorithmically allocate taxis in Singapore by combining passenger demand and taxi supply data with machine learning techniques to develop a decision engine that directs taxi drivers to where they are needed most.

Previously, he worked on the LIVE Singapore project to analyse and visualise data generated by Singapore's transport network with the aim of evaluating new mobility solutions for urban settings in and beyond Singapore.