Google Maps
State of the Art of the Online Road Map

The primary use of Google Maps is navigation on land and finding a route for travelling by car, public transport, bike, airplane or on foot. It is hard to find a tool better suited for these tasks than Google Maps. When travelling by car is considered, the application provides one or more routes, each with corresponding length in km or miles and time needed to reach the destination. The recommended route is given coloured blue, while others are grey. For public transport routes, e.g. in Zagreb, it lists numbers of tram and bus lines and travelling time.

If one wants to go from Sukošan to Veli Rat on Dugi otok, Google Maps will draw a route from Sukošan to ferry port in Zadar, note the user should take a ferry from Zadar to Brbinj (Dugi otok), and it will draw a route to Veli Rat on Dugi otok (Fig. 1). Google Maps also provides details on road designations, roundabout exits, etc.

Three routes are suggested for a trip from Zagreb to London. One is by car, one by public transport (4 hours longer than by car) and one by airplane (2 hours, 25 minutes) (Fig. 2).

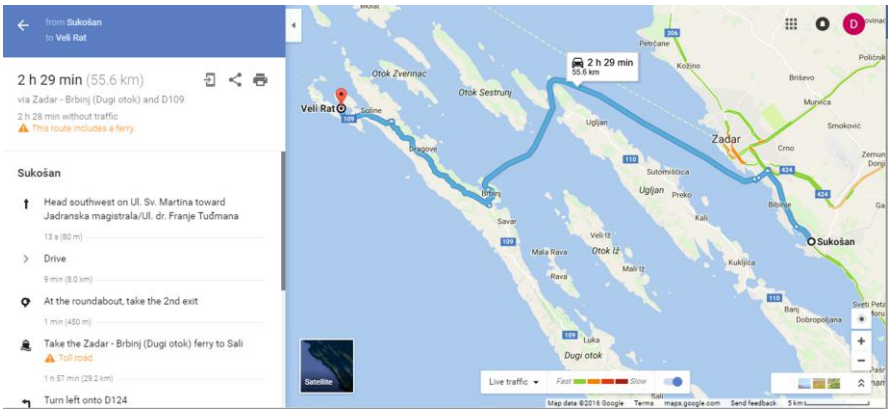

Fig. 1 Car (and ferry) route from Sukošan to Veli Rat as suggested by *Google Maps*
Slika 1. Ruta za putovanje automobilom (i trajektom) od Sukošana do Veloga Rata koju predlaže *Google Maps*

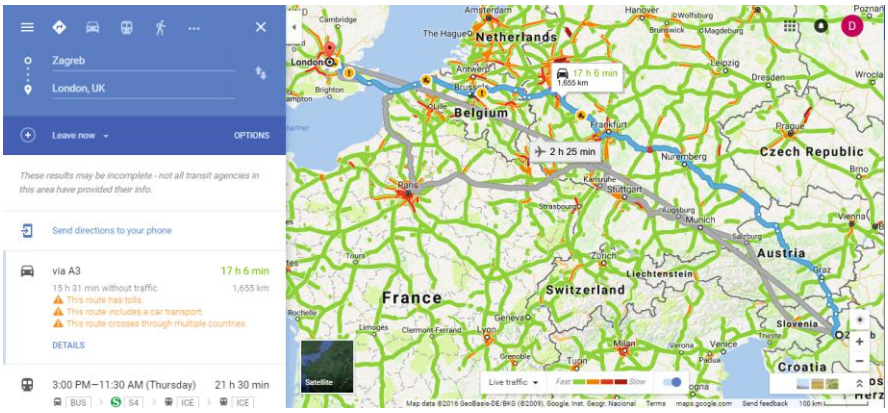

Fig. 2 Car, public transport, and airplane routes from Zagreb to London as suggested by *Google Maps*
Slika 2. Rute za putovanje automobilom, javnim prijevozom i zrakoplovom od Zagreba do Londona koje predlaže *Google Maps*

Similar functionalities can be found in other web-services, but the advantage of Google Maps, along with several network services, is the use of real time data on road traffic. In order to see these data on the map, one needs to turn on the Traffic in the drop down menu on the top left. Four colours (green, yellow, red and dark red) stand for traffic conditions on roads. Green means normal speed, yellow means that traffic is slower, red means traffic jams and dark red means the traffic is almost stopped.

Google takes the data needed to show traffic conditions from smartphones in cars with enabled GPS. A map of real time traffic conditions is generated by calculating the speed of phones/users on the road. When an obstacle slows, or stops traffic on the road, colours on the maps are updated accordingly. Google Maps also provides users with historical, i.e. average data on usual traffic conditions for days in week and time of day. This is very useful when one plans a trip. Google states that data on speed and used roads collected from users are anonymous (Wikipedia 2016).

Fig. 3 shows real time traffic conditions at 8:30 a.m. on September 7, 2016 in Zagreb, for a trip from Ilica 300 to Avenija Dubrava 100. It takes 49 minutes to reach the destination by public transport and 30 minutes by car.

Google Maps provides more than 20 levels of details for maps, and each road segment can be shown in a larger or smaller scale. Street View can also be activated for visual inspection of roads and nearby objects taken with camera.

In addition to traffic conditions according to speed on road segments, other obstacles are indicated with point map symbols:

- Traffic accidents
- Road works
- Closed roads (closed roads are highlighted with a red dotted line)
- Other obstacles

Google Maps
suvremena internetska autokarta

Google Maps je prvenstveno namijenjen snalaženju u prostoru i kretanju od jedne točke do druge automobilom, javnim prijevozom, pješice, biciklom ili zrakoplovom. U tu svrhu teško je pronaći bolji alat. Za kretanje automobilom od jedne točke do druge aplikacija nacrta jednu ili više ruta, za svaku naznači duljinu u kilometrima i potrebno vrijeme. Preporučena ruta nacrtana je plavom bojom, ostale sivom. Za rutu javnog prijevoza, npr. u Zagrebu, navede brojeve tramvajskih i autobusnih linija te također potrebno vrijeme.

Želimo li npr. od Sukošana stići do Veloga Rata na Dugom otoku, nacrtat će dionicu od Sukošana do trajektne luke u Zadru, u napomenama navesti da pređemo na trajekt Zadar – Brbinj (Dugi otok) i na Dugom otoku nacrtati dionicu do Velog Rata (sl. 1). U opisu puta (*Details*) navest će ceste kojima moramo voziti, na kojem izlazu kružnog toka moramo izaći i sl.

Za put od Zagreba do Londona nacrtat će rutu vožnje automobilom, rutu javnim prijevozom preko Pariza koja traje oko četiri sata dulje i zrakoplovnu liniju (sl. 2) za koju je navedeno da traje 2 sata i 25 minuta.

Slične usluge nude i drugi mrežni servisi, ali ono što *Google Maps*, uz još nekoliko mrežnih servisa, čini jedinstvenim jesu podaci o prometu u stvarnom vremenu. U padajućem izborniku lijevo gore na ekranu treba uključiti *Traffic*. S četiri boje (zelena, žuta, crvena i tamno crvena) označene su brzine prometa. Zelena znači normalnu brzinu prometa, žuta sporije prometne uvjete, crvena zagušenja i tamno crvena ukazuje na gotovo zaustavljen promet.

Podatke o prometu *Google* dobiva automatski iz automobila preko pametnih telefona s ugrađenim GPS-om. Računajući brzinu kojom se korisnici kreću cestom *Google* generira kartu prometa u realnom vremenu. Ako na nekoj cesti dođe do zagušenja prometa, mijenjaju se boje koje označavaju brzinu prometa. *Google Maps* omogućuje korisnicima i uvid u „povijesne podatke“, tj. podatke o uobičajenom prometu u pojedine dane u tjednu i u određeno vrijeme, što korisniku omogućava planiranje puta unaprijed. *Google* garantira da su podaci koje skuplja o brzini kojom su korisnici vozili i ceste kojima su se kretali anonimni (Wikipedia 2016).

Na sl. 3 prikazan je promet u stvarnom vremenu u Zagrebu na potezu od Ilice 300 do Avenije Dubrava 100 u srijedu 7. rujna 2016. u 8:30 sati. Vožnja javnim prijevozom traje 49 minuta, a automobilom 30 minuta.

Budući da Google Maps sadrži karte u 20-tak različitih razina detalja, korisnik može svaku dionicu puta prikazati u nekom krupnijem mjerilu, a po želji uključiti i Street View te vidjeti određeni dio ceste i objekte uz nju snimljene kamerom iz neposredne blizine.

Osim gustoće prometa na kartama su točkastim kartografskim znakovima označene i druge prepreke u prometu:

- Prometne nesreće
- Radovi na cesti
- Zatvorene ceste (zatvorene ceste prikazane su i crvenim točkama uzduž ceste)
- Ostale prepreke

Klikom na znak mogu se dobiti detaljne informacije o događaju.

Masovno prikupljanje podataka (crowdsourcing) – temeljni izvor za podatke o prometu

Problem gužvi u prometu u gradovima star je desetljećima. Različiti sustavi nadzora i izvještavanja su do sada primijenjeni za dobivanje informacija o stanju u prometu i izvještavanju o njemu (ručno brojanje prometa, senzori brojila prometa, uvid u stanje prometa iz zraka, prometne kamere, izvješćivanje putem radija i televizije, izvješćivanje putem weba i sl.).

Masovno prikupljanje podataka kao noviji oblik prikupljanja podataka koji se temelji na dobrovoljnom dijeljenju podataka mnoštva ljudi, uglavnom putem interneta, u tom Googleovu servisu pokazalo se iznimno uspješnim. Slično, kartografski servis koji se temelji na masovnom prikupljanju podataka, a koji je također do sada pokazao izniman uspjeh je *OpenStreetMap*.

Ideju je u početku razvijala i primijenila tvrtka *Zipdash* iz Palo Altoa. Tvrtku je 2004. godine otkupio *Google* i

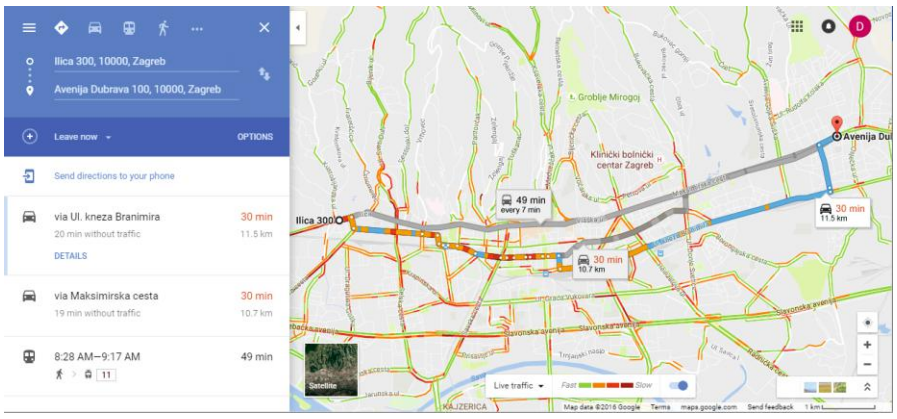

Fig. 3 Routes for a trip by car and public transport from Ilica 300 to Avenija Dubrava 100 in Zagreb recommended by *Google Maps* using real time traffic conditions

Slika 3. Rute za putovanje automobilom i javnim prijevozom u Zagrebu od Ilice 300 do Avenije Dubrava 100 koje predlaže *Google Maps* uzimajući u obzir stanje u prometu

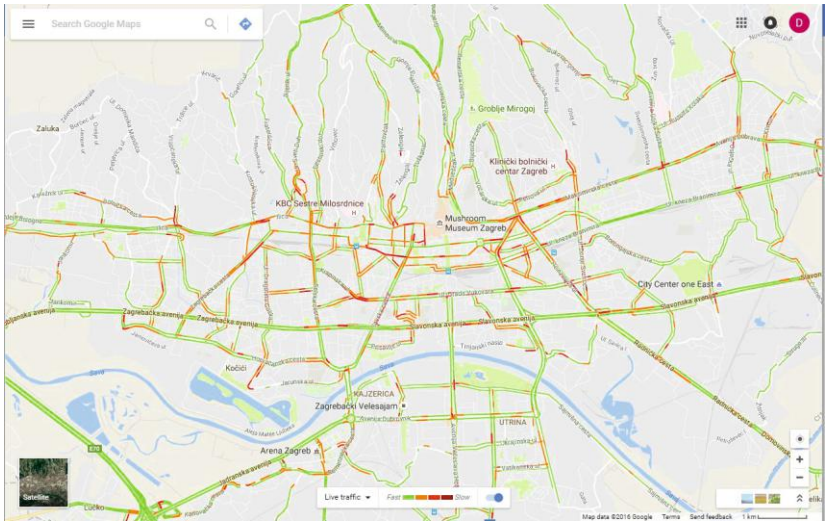

Fig. 4 Traffic conditions in Zagreb on September 6, 2016, 9.30 CET
Slika 4. Gustoća prometa u Zagrebu, 6. 9. 2016. u 9:30 CET

Fig. 5 Traffic conditions in Paris on September 6, 2016, 9.30 CET
Slika 5. Gustoća prometa u Parizu, 6. 9. 2016. u 9:30 CET

Details on events can be obtained by clicking on symbols.

Crowdsourcing – Basic Source of Traffic Data

Slow traffic and traffic jams in cities has been a problem for decades. Different systems of surveillance and reporting were used to obtain information on traffic conditions and notify commuters (manual counting of vehicles, vehicle counting sensors, air surveillance, traffic cameras, radio and TV reporting, web reporting, etc.).

Crowdsourcing is one of the latest ways to collect data. It is based on voluntary sharing of data by people, usually over the Internet. It has been a real success in this Google service. OpenStreeMap is a similar successful map service based on crowdsourcing.

The idea used in Google Maps Traffic was first developed by company Zipdash from Palo Alto. In 2004, the company was acquired by Google and solutions were implemented in Google Maps in 2007 (Green 2004). The service has been available in Croatia since 2013. At first, it was only available for Zagreb, but as of September 2016, it is available for almost the entire country.

If we look at discussions on social networks when Google Maps Traffic appeared, we can conclude that users were not fully aware how this service is realized. The first question is how Google gets crowdsourced data from its users. The answer is in a setting that enables smartphones to send their location and record these data on Google servers. If you enable this, Google will track and record these data on the location and movement of your smartphone, i.e. you in case that you are the one carrying it.

When you log in at Google Maps user pages (https://www.google.com/maps/timeline), you can check/edit/delete data on your movements stored while it was enabled (Fig. 6 and 7).

The first issue which comes up in such situations is the one of privacy. Google guarantees that data published on Google Maps Traffic are anonymised and abstracted and that individual data are not stored on servers.

We can identify three groups of users: sceptics, i.e. those who are not comfortable with the fact that Google (or anyone else) can use their private data; enthusiasts, i.e. those who support such ideas and free and open data and services resulting from it, regardless of their private data being used; and non-informed or apathetic, i.e. those who might not be aware that they participate in such crowdsourcing or those who do not care whether their private data is collected in certain situations.

If you do not want to share your location over smartphone, you should disable it (Tweney 2014, Henry 2013). Nevertheless, as long as there are enough of those willing to share their location data with Google Maps Traffic, all of us will have this useful and valuable service and many people can make their life easier in everyday commuting and finding alternative ways of reaching their destinations.

Dražen Tutić
Nedjeljko Frančula ■

ugradio rješenja u Google Maps 2007. godine (Green 2004). U Hrvatskoj je usluga dostupna od 2013. godine, prvo samo u Zagrebu, a danas u rujnu 2016. na gotovo cijelom području Hrvatske.

Pregledaju li se rasprave na društvenim mrežama u doba kada se pojavio Google Maps Traffic, može se zaključiti da korisnici nisu (bili) sasvim svjesni na koji način ta usluga nastaje. Prvo je pitanje na koji način Google dolazi do dobrovoljnih podataka od korisnika. Odgovor leži u omogućavanju slanja položaja pametnog telefona i zapisivanju tih podataka na Googleove poslužitelje. Ukoliko uključite tu mogućnost Google će prikupljati i spremati informacije o kretanju vašeg pametnog telefona, tj. vas, uz pretpostavku da ga vi nosite.

Na stranicama Google Mapsa (https://www.google.com/maps/timeline), tj. nakon prijave sa svojim računom, možete pogledati/uređivati/brisati podatke o vašem kretanju, a koji su zapisani za vrijeme kada ste to omogućili (sl. 6 i 7).

Prvo pitanje koje će si svaki korisnik/potencijalni sudionik prikupljanja podataka postaviti je pitanje privatnosti podataka. Google svojim izjavama jamči da su podaci objavljeni na Google Maps Trafficu anonimizirani i apstrahirani te se pojedinačni podaci ne čuvaju na poslužiteljima te usluge.

Korisnike možemo podijeliti u tri skupine: skeptike, tj. one koji nikako nisu zadovoljni sa činjenicom da Google (ili netko drugi) može rabiti njihove privatne podatke; entuzijaste, tj. one koji podržavaju takve ideje i besplatne podatke i usluge koje iz toga proizlaze bez obzira što su i njihovi privatni podaci pri tome upotrijebljeni; te neinformirane ili ravnodušne, tj. one koji možda nisu niti svjesni da sudjeluju u takvom prikupljanju podataka, odnosno one kojima je svejedno da li se u nekom trenutku to prikupljanje podataka odvija ili ne.

Ukoliko ne želite dijeliti podatke potrebno je na pametnom telefonu onemogućiti dijeljenje vašeg položaja i zapisivanje kretanja (Tweney 2014, Henry 2013). Međutim sve dok ima dovoljan broj onih koji će dijeliti svoje podatke o vlastitom kretanju s Google Maps Trafficom, svi ćemo imati na raspolaganju tu zaista korisnu i vrijednu uslugu koja mnogima može olakšati svakodnevicu u prometu ili im omogućiti da razmisle o alternativnim načinima kretanja kroz grad.

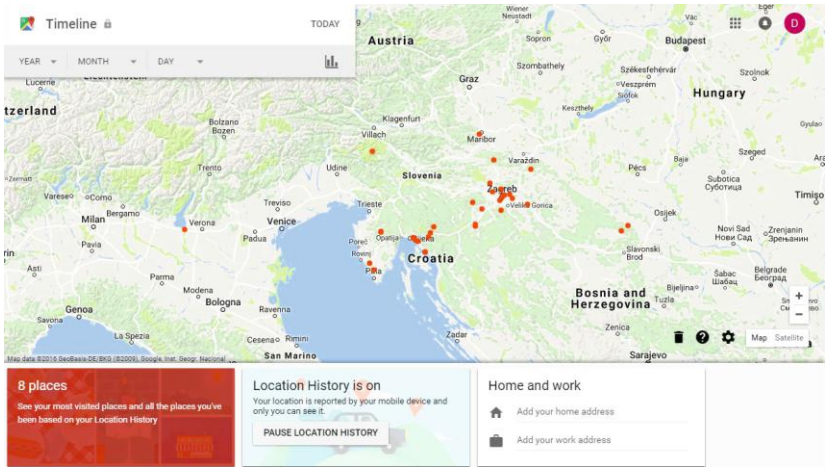

Fig. 6 Locations which one of the authors visited from 2014 to 2016, recorded by Google during the time of enabled location sharing and logging location data
Slika 6. Mjesta koja je jedan od autora posjetio u razdoblju 2014-2016., a koja je zabilježio Google putem dijeljenja i zapisivanja podataka o položaju

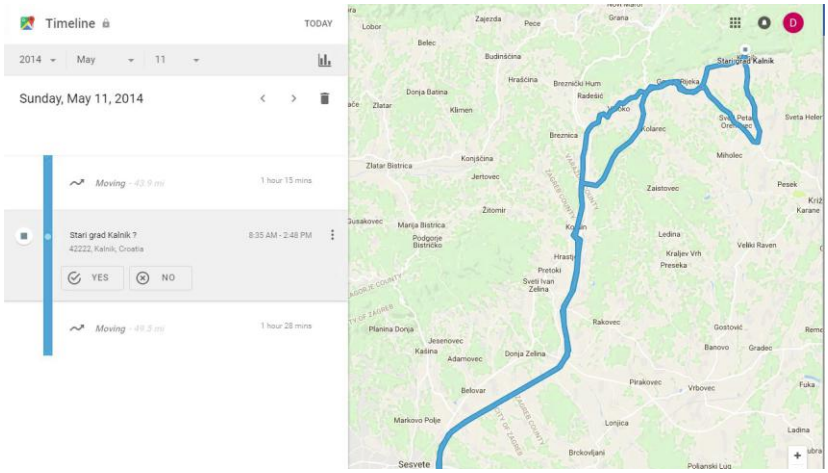

Fig. 7 Details of a trip of one of the authors recorded on Sunday, May 11, 2014.
Slika 7. Detalji jednog kretanja jednog od autora koje je zabilježeno u nedjelju, 11. 5. 2014.

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Dražen Tutić
Nedjeljko Frančula ■