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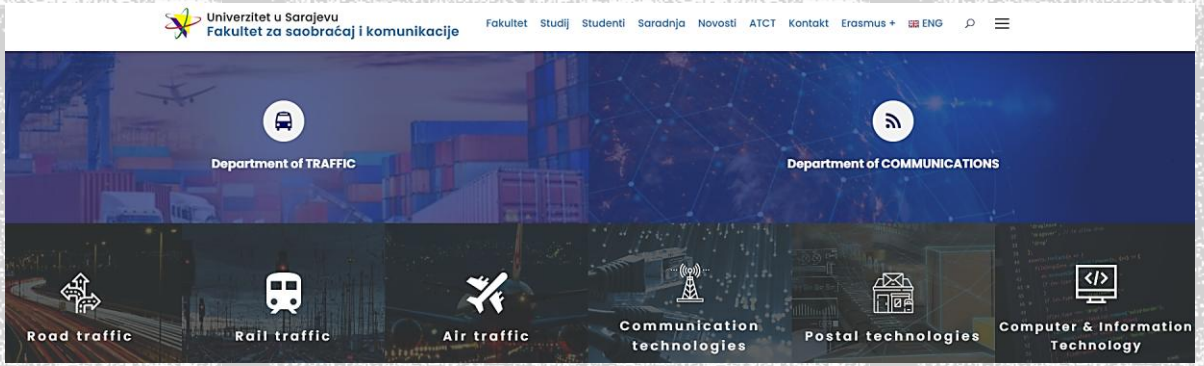


IoT RJEŠENJA ZA INDUSTRIJU ELEKTRIČNIH VOZILA

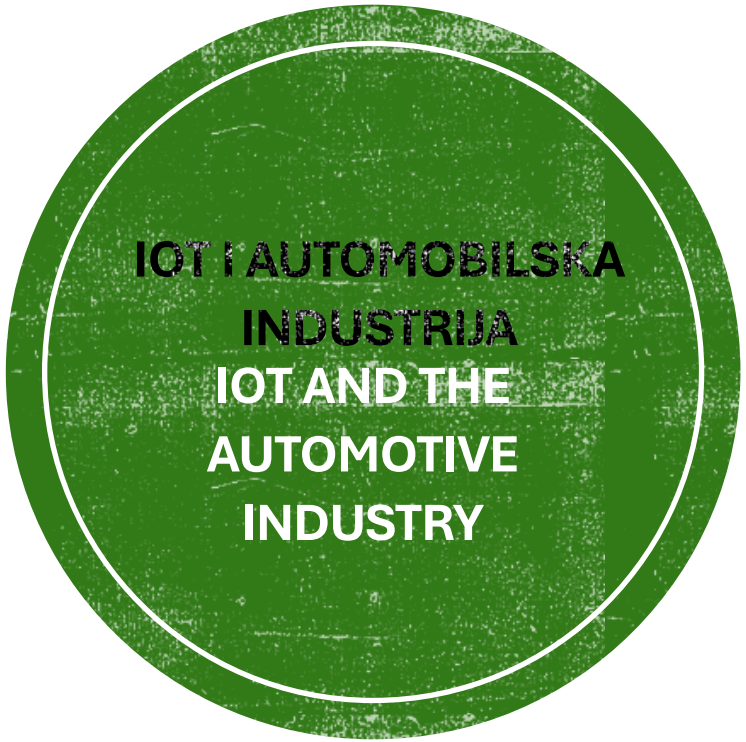
IOT SOLUTIONS FOR THE ELECTRIC VEHICLE INDUSTRY

IOT RJEŠENJA ZA EV INFRASTRUKTURU

Industrija električnih vozila (EV) doživljava značajan rast zbog potrebe za smanjenjem emisija gasova s efektom staklene bašte i tražnje za održivijim oblicima transporta. Sve šire tržište za punjenje električnih vozila i povećana konsolidacija dobavljača naglašavaju potrebu za pouzdanim, dosljednim uslugama u svim regijama i mrežama. IoT tehnologija je centralna za ovo, olakšava trenutnu razmjenu podataka i efikasno daljinsko upravljanje infrastrukturom za punjenje.

IOT SOLUTION FOR EV INFRASTUCTURE

The electric vehicle (EV) industry is experiencing significant growth due to the need to reduce greenhouse gas emissions and the demand for more sustainable forms of transportation. The expanding market for EV charging and the increasing consolidation of suppliers highlight the need for reliable and consistent services across all regions and networks. IoT technology plays a central role in this, enabling real-time data exchange and efficient remote management of charging infrastructure.



IoT (Internet of Things) je paradigma zasnovana na integraciji različitih procesa kao što su identifikacija, detekcija, umrežavanje i procesuiranje podataka što je omogućeno primjenom novih tehnologija koje obezbjeđuju povezanost između fizičkih i virtuelnih objekata kako bi se olakšao razvoj „inteligentnih usluga“ i aplikacija. Procjenjuje se da će globalno tržište IoT-a u svim oblastima automobilske industrije, ne samo povezanim automobilima, porasti na 322 milijarde dolara do 2028.

IoT (Internet of Things) is a paradigm based on the integration of various processes such as identification, detection, networking, and data processing. This is made possible through the use of new technologies that ensure connectivity between physical and virtual objects, facilitating the development of “intelligent services” and applications.It is estimated that the global IoT market across all areas of the automotive industry—not just connected cars—will grow to $322 billion by 2028.

IoT tehnologije igraju ključnu ulogu u optimizaciji performansi električnih vozila, poboljšavajući njihovu efikasnost, bezbjednost i praktičnost. Ove tehnologije doprinose stvaranju povezane i održive mobilnosti u kontekstu rastuće industrije električnih vozila. Pomoću IoT platforme možemo prikupiti podatke o ponašanju vlasnika električnih vozila i različitim metodama (npr. mašinsko učenje) predvidjeti nivo napunjenosti električnih vozila u dolasku na parking, lokaciju automobila, period priključka na parking, itd. Očekuje se da će električna vozila (EV) i automatizirana vožnja, opremljena sistemima za pohranu energije na baterije (BESS), dominirati javnim prijevozom u pametnim gradovima. Kako broj povezanih vozila nastavlja da raste, konvencionalne ad hoc mreže za vozila sada se razvijaju kao sastavni dio IoT sistema poznat kao Internet vozila (IoV).

IoT technologies play a key role in optimizing the performance of electric vehicles, enhancing their efficiency, safety, and convenience. These technologies contribute to creating connected and sustainable mobility within the growing electric vehicle industry. Using IoT platforms, it is possible to collect data on electric vehicle owners' behavior and, through various methods (e.g., machine learning), predict battery charge levels upon arrival at a parking lot, vehicle location, connection duration, and more. Electric vehicles (EVs) and automated driving systems equipped with battery energy storage systems (BESS) are expected to dominate public transport in smart cities. As the number of connected vehicles continues to grow, conventional ad hoc vehicular networks are now evolving into an integral part of the IoT ecosystem, known as the Internet of Vehicles (IoV).

IOV - INTERNET VOZILA

IOV – INTERNET OF VEHICLES

IoT tehnologije igraju ključnu ulogu u razvoju industrije električnih vozila (EVs) na više načina:

- Praćenje i upravljanje baterijama
- Povezivanje sa punionicama
- Upravljanje flotom vozila
- Sigurnost i autonomna vožnja
- Poboljšane korisničke usluge
- Analitika i održavanje

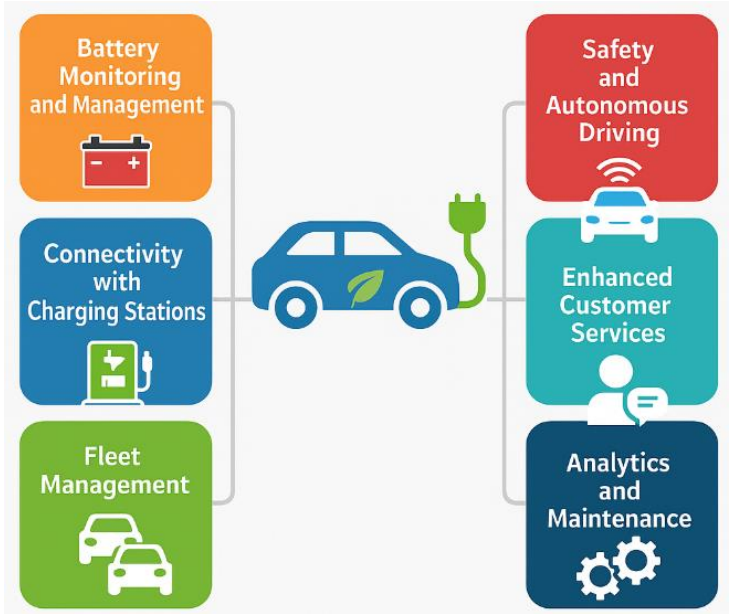
IoT technologies play a crucial role in the development of the electric vehicle (EV) industry in several ways:

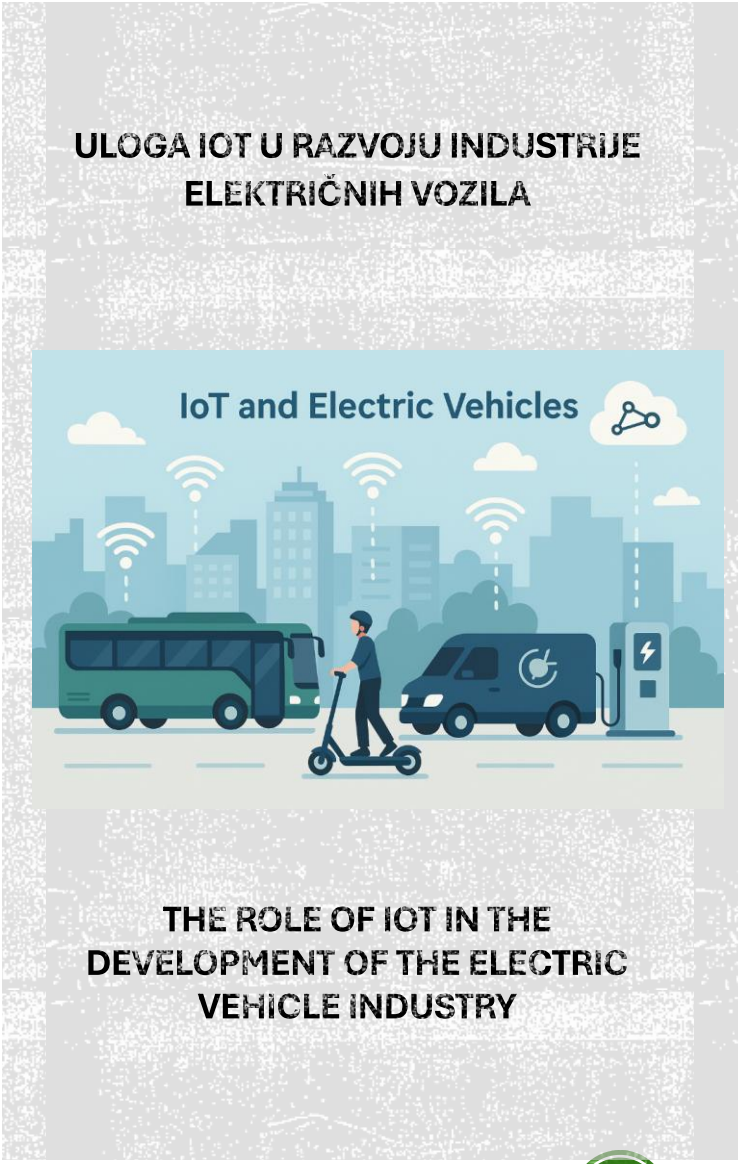
- Battery Monitoring and Management
- Connectivity with Charging Stations
- Fleet Management
- Safety and Autonomous Driving
- Enhanced Customer Services
- Analytics and Maintenance

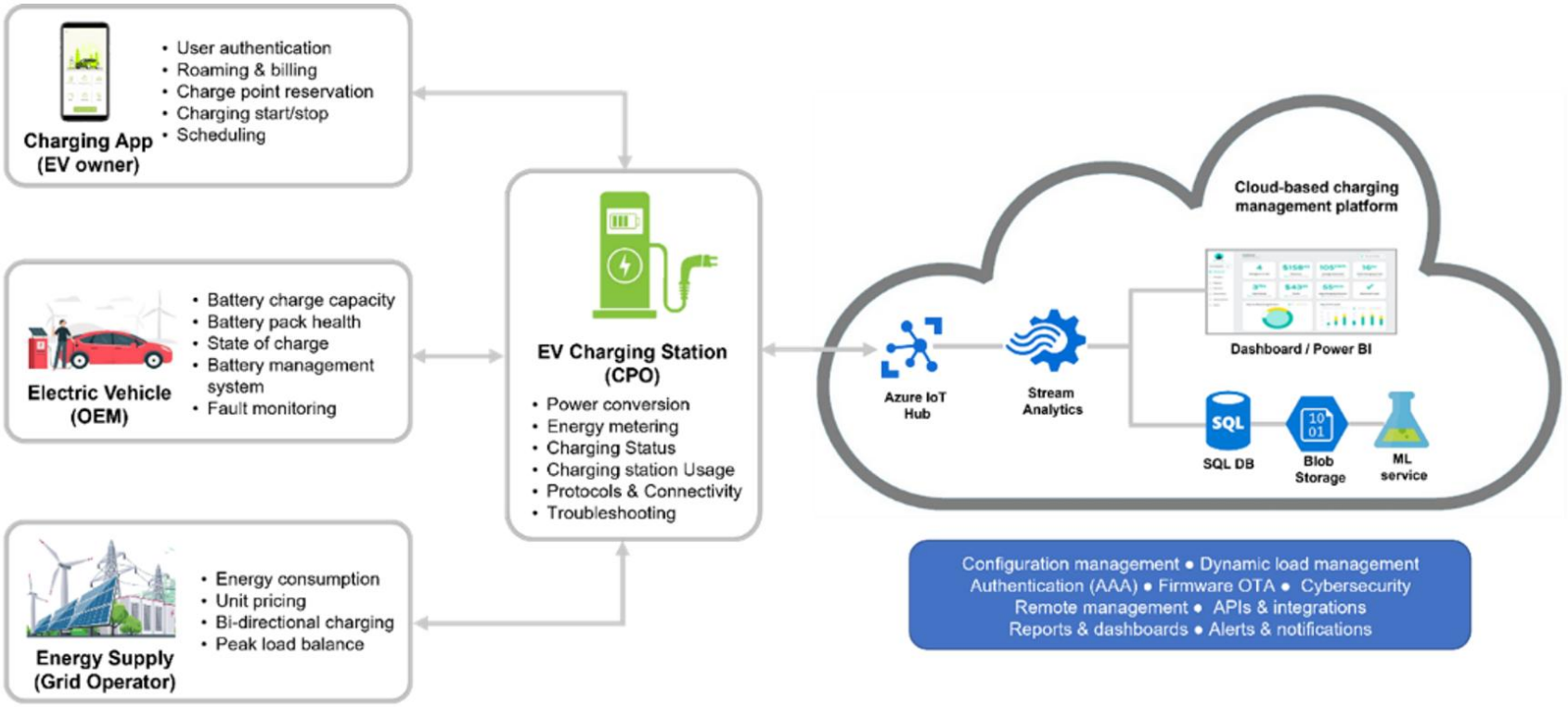
ULOGA IOT U RAZVOJU INDUSTRIJE ELEKTRIČNIH VOZILA

THE ROLE OF IOT IN THE DEVELOPMENT OF THE ELECTRIC VEHICLE INDUSTRY


Praćenje baterija i upravljanje
Povezivost sa stanicama za punjenje
Upravljanje voznim parkom
Sigurnost i autonomna vožnja
Unaprijeđene korisničke usluge
Analitika i održavanje


Battery Monitoring and Management
Connectivity with Charging Stations
Fleet Management
Safety and Autonomous Driving
Enhanced Customer Services
Analytics and Maintenance


ULOGA IOT U RAZVOJU INDUSTRIJE ELEKTRIČNIH VOZILA
IoT and Electric Vehicles
THE ROLE OF IOT IN THE DEVELOPMENT OF THE ELECTRIC VEHICLE INDUSTRY



Uloga IoT tehnologija za punjenje električnih vozila

The Role of IoT Technologies in Charging Electric Vehicles

Primjena IoT u razvoju električnih vozila nosi sa sobom određene izazove i rizike:

- Sigurnost podataka
- Privatnost vozača
- Interoperabilnost
- Pouzdanost i dostupnost mreže
- Održavanje i ažuriranje
- Troškovi i investicije
- Regulativni izazovi

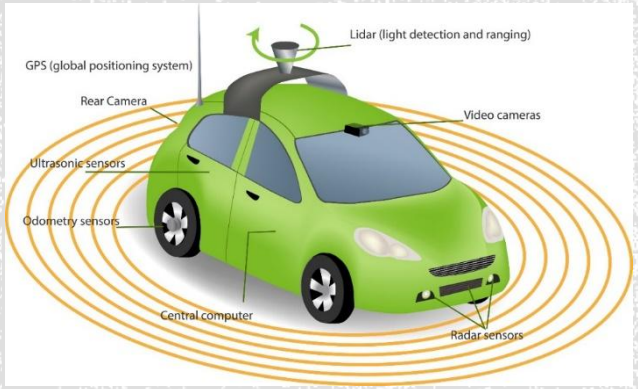
The application of IoT in the development of electric vehicles brings certain challenges and risks, including:

- Data security
- Driver privacy
- Interoperability
- Network reliability and availability
- Maintenance and updates
- Costs and investments
- Regulatory challenges

Senzori su uređaji koji mapiraju otkrivene događaje ili promjene u okruženju u kvantitativno mjerenje za dalju obradu. Općenito, senzori se dijele u dvije klase na osnovu njihovog principa rada. Proprioceptivni senzori, ili senzori unutrašnjeg stanja, hvataju dinamičko stanje i mjere unutrašnje vrijednosti dinamičkog sistema, na primjer, silu, ugaonu brzinu, napon baterije itd. Primjeri proprioceptivnih senzora uključuju jedinice za mjerenje inercije (IMU), enkodere, inercijalne senzore (žiroskope i magnetometre) i senzore za pozicioniranje (GNSS prijemnici). Nasuprot tome, eksteroceptivni senzori, ili vanjski senzori stanja, osjećaju i prikupljaju informacije kao što su mjerenje udaljenosti ili intenzitet svjetlosti iz okoline sistema. Kamere, radio detekcija i domet (Radar), detekcija i domet svjetlosti (LiDAR) i ultrazvučni senzori su primjeri eksteroceptivnih senzora.

Sensors are devices that map detected events or changes in the environment into quantitative measurements for further processing. In general, sensors are divided into two classes based on their operating principle. Proprioceptive sensors, or internal state sensors, capture the dynamic state and measure internal values of a dynamic system, such as force, angular velocity, battery voltage, etc. Examples of proprioceptive sensors include inertial measurement units (IMUs), encoders, inertial sensors (gyroscopes and magnetometers), and positioning sensors (GNSS receivers).In contrast, exteroceptive sensors, or external state sensors, sense and collect information such as distance measurements or light intensity from the system's environment. Examples of exteroceptive sensors include cameras, radio detection and ranging (Radar), light detection and ranging (LiDAR), and ultrasonic sensors.

SENZORSKE TEHNOLOGIJE ZA ELEKTRIČNA VOZILA



SENSOR TECHNOLOGIES FOR ELECTRIC VEHICLES

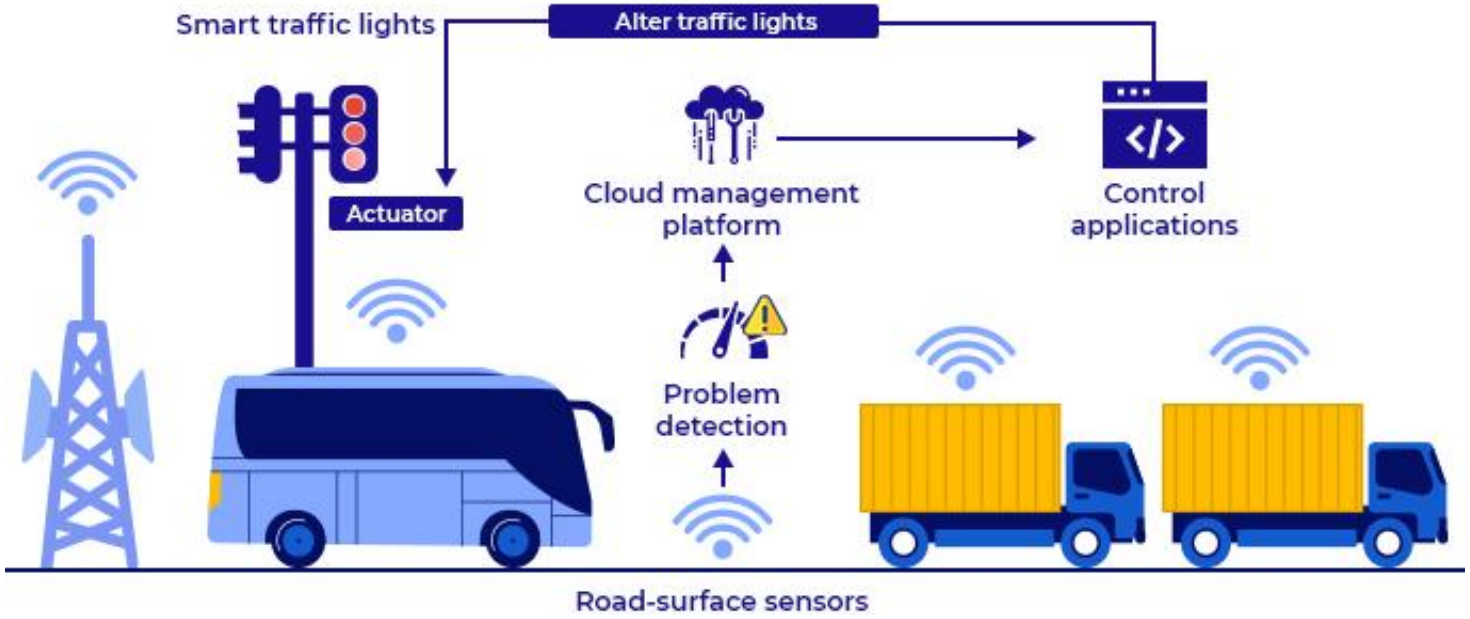
5G mreže igraju ključnu ulogu u podršci IoT (Internet of Things) aplikacijama u električnim vozilima, pružajući napredne mogućnosti povezivanja koje su bitne za optimizaciju performansi, sigurnosti i održivosti ove vrste transporta. Mobilna industrija prolazi kroz proces transformacije koji se pokreće eksponencijalnim rastom saobraćaja (mobilni širokopojasni pristup i video), nove usluge (primjerice, Internet stvari (IoT) i privatni mobilni radio) i novi zahtjevi (niža latencija i sveprisutnu pokrivenost), dolazak autonomnih vozila. IoT omogućava internetske veze i interoperabilnost podataka za brojne pametne objekte i aplikacije. 5G tehnologija ključna je za implementaciju masovnog Internet of Things, jer podržava povezivanje po principu „bilo gdje, bilo kad, bilo ko i bilo šta".

5G networks play a crucial role in supporting IoT (Internet of Things) applications in electric vehicles, providing advanced connectivity capabilities essential for optimizing performance, safety, and sustainability of this mode of transport. The mobile industry is undergoing a transformation driven by the exponential growth of traffic (mobile broadband and video), new services (such as the Internet of Things (IoT) and private mobile radio), and emerging demands (lower latency and ubiquitous coverage), as well as the arrival of autonomous vehicles. IoT enables internet connectivity and data interoperability for numerous smart objects and applications.5G technology is essential for the implementation of massive IoT, as it supports connectivity based on the principle of "anywhere, anytime, anyone, and anything."

Uloga 5G mreža u podršci IoT aplikacijama u električnim vozilima

The Role of 5G Networks in Supporting IoT Applications in Electric Vehicles

Sistem pametnih semafora je automatski sistem upravljanja vozilima u kojem se kombinuju nove tehnologije (senzori) i tehnike umjetne inteligencije za kontrolu protoka saobraćaja na signaliziranim raskrsnicama.

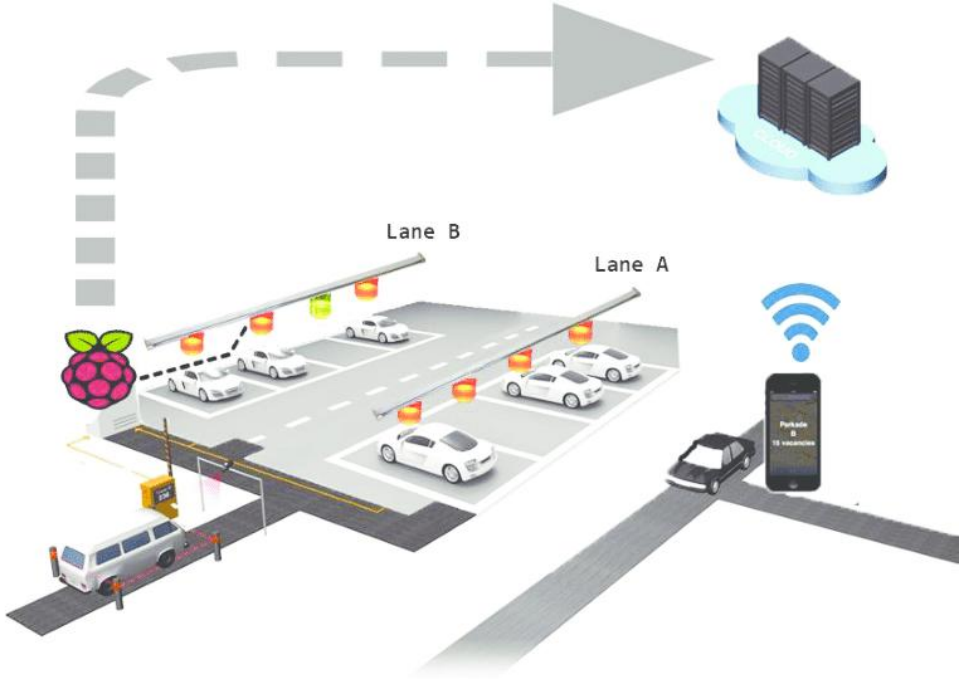


A smart traffic light system is an automated vehicle management system that combines new technologies (sensors) and artificial intelligence techniques to control traffic flow at signalized intersections.

PAMETNI SEMAFORI

SMART TRAFFIC LIGHTS

Pametni parking je sistem koji koristi senzore za detekciju zauzetosti parking mjesta. Ove informacije se mogu proslijeđivati vozačima kako bi smanjili vrijeme pronalaska odgovarajućeg parkinga. Ključni cilj treba da bude održivo rješenje za terminale mirujućeg saobraćaja koji će na dugoročan vremenski period da omogući dovoljan broj parking mjesta za sve korisnike.



Smart parking is a system that uses sensors to detect the occupancy of parking spaces. This information can be relayed to drivers to reduce the time needed to find an available parking spot.The key goal should be to provide a sustainable solution for stationary traffic terminals that ensures a sufficient number of parking spaces for all users over the long term.

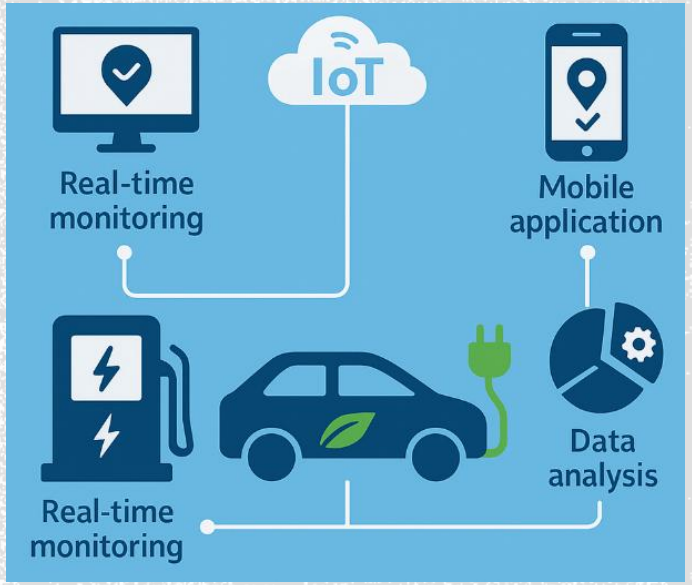
PAMETNI PARKING

SMART PARKING

IoT rješenja igraju ključnu ulogu u razvoju infrastrukture za električna vozila, posebno kada je riječ o pametnim punionicama. Zahvaljujući IoT tehnologijama, moguće je pratiti status punionica u realnom vremenu, optimizirati njihovu dostupnost i upravljati potrošnjom energije. Korisnici putem aplikacija mogu locirati najbližu slobodnu punionicu, rezervisati termin i pratiti proces punjenja. Ova povezanost doprinosi boljoj efikasnosti mreže, smanjuje gužve i povećava zadovoljstvo korisnika. Integracija IoT-a omogućava i napredno održavanje punionica kroz analizu podataka i preventivne intervencije.

IoT solutions play a key role in the development of infrastructure for electric vehicles, especially when it comes to smart charging stations. Thanks to IoT technologies, it is possible to monitor the status of charging stations in real time, optimize their availability, and manage energy consumption. Through mobile applications, users can locate the nearest available charging station, reserve a time slot, and track the charging process. This connectivity contributes to greater network efficiency, reduces congestion, and enhances user satisfaction. The integration of IoT also enables advanced maintenance of charging stations through data analysis and preventive interventions.

IoT rješenja za punionice električnih vozila



IoT solutions for electric vehicle charging stations

IoT rješenja za električne romobile

IoT rješenja igraju ključnu ulogu u unapređenju korištenja električnih romobila i razvoja njihove infrastrukture. Kroz povezivanje romobila s pametnim sistemima, omogućeno je praćenje lokacije, statusa baterije, načina vožnje i sigurnosnih parametara u realnom vremenu. Infrastruktura podržana IoT-om obuhvata pametne stanice za punjenje, sustave za upravljanje flotom te integraciju s aplikacijama za najam i navigaciju. Ova rješenja doprinose održivom urbanom transportu, povećavaju efikasnost i sigurnost, te olakšavaju donošenje odluka baziranih na podacima.

IoT solutions for electric scooters

IoT solutions play a key role in enhancing the use of electric scooters and the development of their infrastructure. By connecting scooters to smart systems, real-time monitoring of location, battery status, driving behavior, and safety parameters is enabled. IoT-supported infrastructure includes smart charging stations, fleet management systems, and integration with rental and navigation apps. These solutions contribute to sustainable urban transport, increase efficiency and safety, and facilitate data-driven decision-making.

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Thank you for your attention

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