DREEM

Designing use**R** centric **E**-kickscooters & business models for **E**nhancing inter**M**odality

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ABSTRACT

Using the WP2 tasks learning, an initial DREEM App mock-up will be developed, and it will be shared with partners involved in the DREEM Ks co-design and development. The mock-up will be revised to cross-check that the needs are met and reflecting their feedback before the 1st pilot starts. Following the agile programming methodology Punch will develop the B2C DREEM APP and the back-end platform available on both IOS/Android systems.

CONTENTS

WP2 - OBJECTIVES

WP2 aims at designing and releasing DREEM KS to be tested during pilots (WP3). The WP has 4 main sub-objectives for the realization of our light 3-wheels electric kickscooter:

- Prototype design and architecture
- Engine
- Helmet & safety features (sensors)
- User interface [DREEM App]. The approach is to work on different tasks focusing on a specific part of the vehicle and its usability. The common result will be a first version of both DREEM vehicle and APP released before WP3 pilots start

WP2 – DESIGN AND ARCHITECTURE

APP PROTOTYPE DESIGN – overview

During the design thinking phase with users the following pain points have been identified:

- Need for an APP to be used as a dashboard with a bigger screen than the usual displays
- Need for a navigation system optimized for micro mobility, reducing the risks related to urban traffic
- Integration of a safety alert system informing the driver in case of risks during the ride. The alert shall be clearly visible on the phone but also available acoustically, so they don't have to be distracted looking to the phone if there is a traffic jam.
- Divers need a way to see behind them without the need to turn themselves.

The first version of the APP has been provided to consortium partners for the first users' engagement loop, collecting feedbacks to be ready for the pilots.

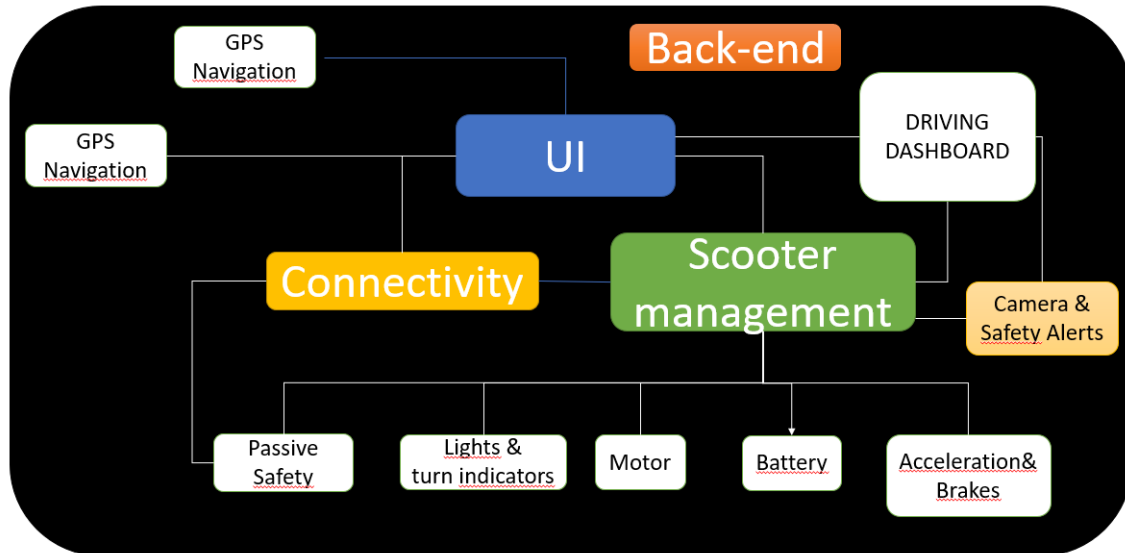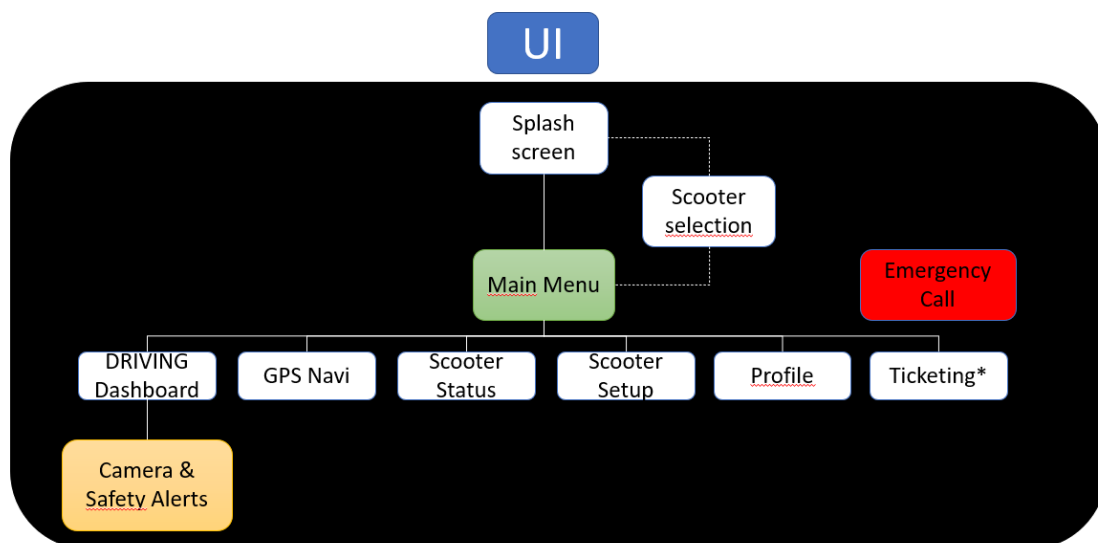## Overall DREEM APP Architecture

Figure 1 – Overall DREEM APP Architecture

DREEM APP is based on 4 main layers:

- User Interface (UI)
- Connectivity (among scooter, smartphone, rear camera and Navigation system)
- Scooter Management
- Back-end

In the following sections it's reported the architecture of each layer.

DREEM APP Architecture – User Interface

Figure 2 – DREEM APP User Interface layer

The User Interface provides to the driver all the needed information to:
- Drive the scooter
- Use the additional safety features
- Interact with navigation system
- Setup each scooter
- Use the emergency call feature: in case of emergencies, just pressing a specific button in the APP it will be possible to connect with a pilot's reference that can provide assistance (demo-version to show the potential of this feature).
- Ticketing page (Turin's pilot only)
- Driver profile with rides history

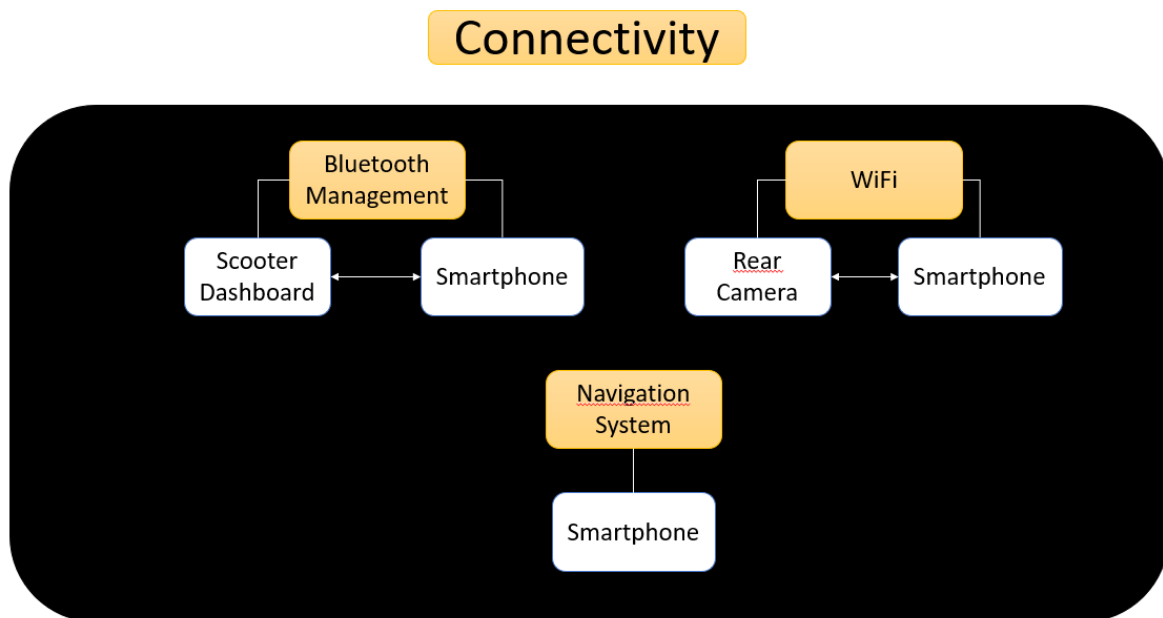## DREEM APP Architecture – Connectivity

Figure 3 – DREEM APP Connectivity layer

The Connectivity layer is capable to manage the connection among:
- Scooter dashboard (bluetooth chip and main scooter processor)
- User's smartphone (Bluetooth, wi-fi, GPS)
- Rear Camera (wi-fi)
- Navigation system (APIs)

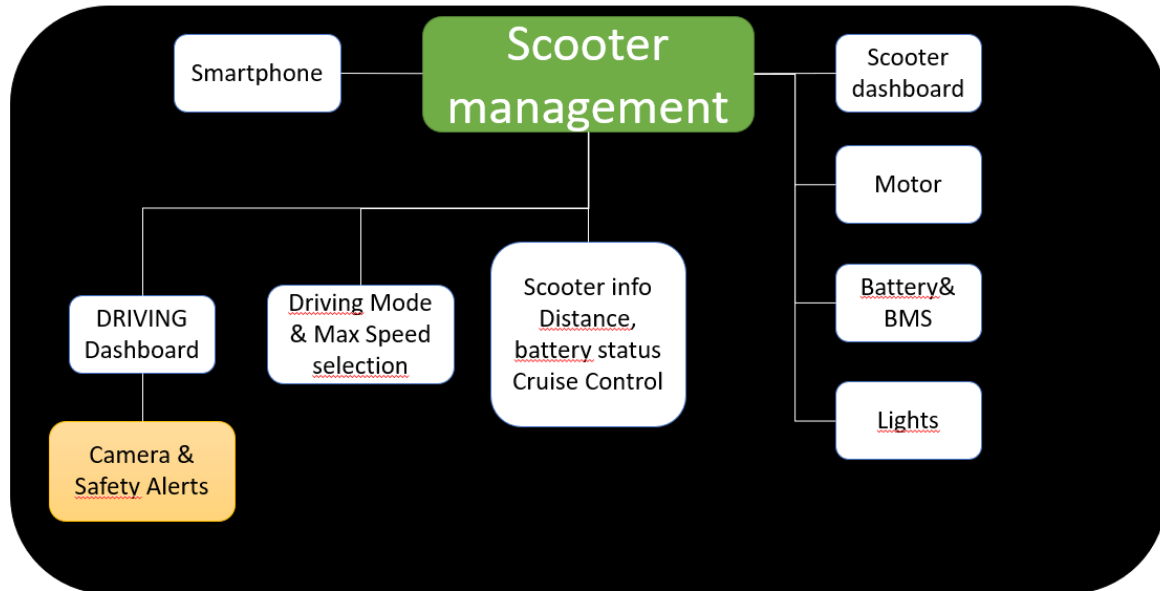## DREEM APP Architecture – Scooter Management

Figure 4 – DREEM APP Scooter Management layer

The Scooter Management layer is designed to manage all technical features related to the scooter:

- Acceleration and brake
- Battery management (bms info exchange and battery status provided to the user)
- Motor control (motor+motor controller)
- Lights and turn indicators management
- Rear Camera management

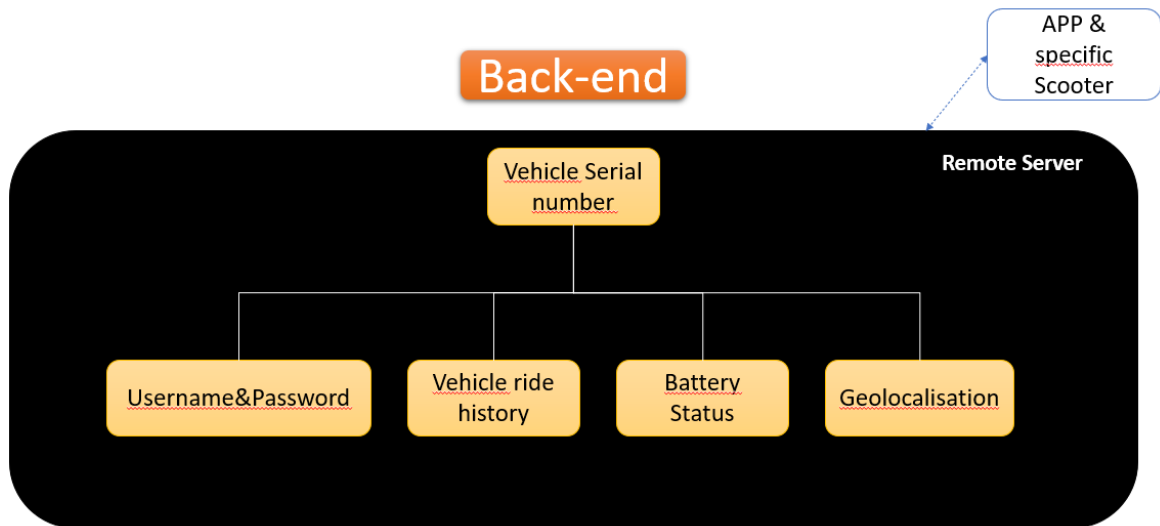## DREEM APP Architecture – Back-end

Figure 5 – DREEM APP Back-end layer

The Back-end layer stores and manage in a specific server the following information related to each scooter (serial NUMBER):

- Username and password
- Vehicle ride history
- Battery Status
- Geolocalization (to providethe right information and assistance based on position, for example the ticketing option in Torino's pilot).

APP PROTOTYPE DESIGN – sections and UX

In the first screen the user has the possibility to choose among the main section of the APP:

- DASHBOARD
- NAVIGATION SYSTEM
- KICKSCOOTER STATUS
- KICKSCOOTER SETUP
- EMERGENCY CALL
- PROFILE
- TICKETING

DASHBOARD

The dashboard graphics gives to the driver the possibility to have in front of him/her the most important scooter information in an large screen. This is improving the safety of the driver since the effort to see the most important information is reduced.

The following are the information reported in the dashboard:

- Scooter speed
- Drive mode selected
- Lights ON/OFF
- Turn indicators ON/OFF
- Battery charge level

On top of that from the dashboard it's possible to activate the additional safety sensor/vision system. That is also object of DREEM project.

This safety system is based on a rear camera, that sends images to the display of driver's smartphone. This first feature is basically providing a digital mirror to micromobility vehicles.

The second feature is based on an **Artificial Intelligence algorithm** that **recognizes** objects in the images, **track**s them and **provides to the driver alerts** in case of risky situations, e.g. vehicles suddenly approaching.

The following is the APP mockup of this safety system and a first version of UI for the final APP:
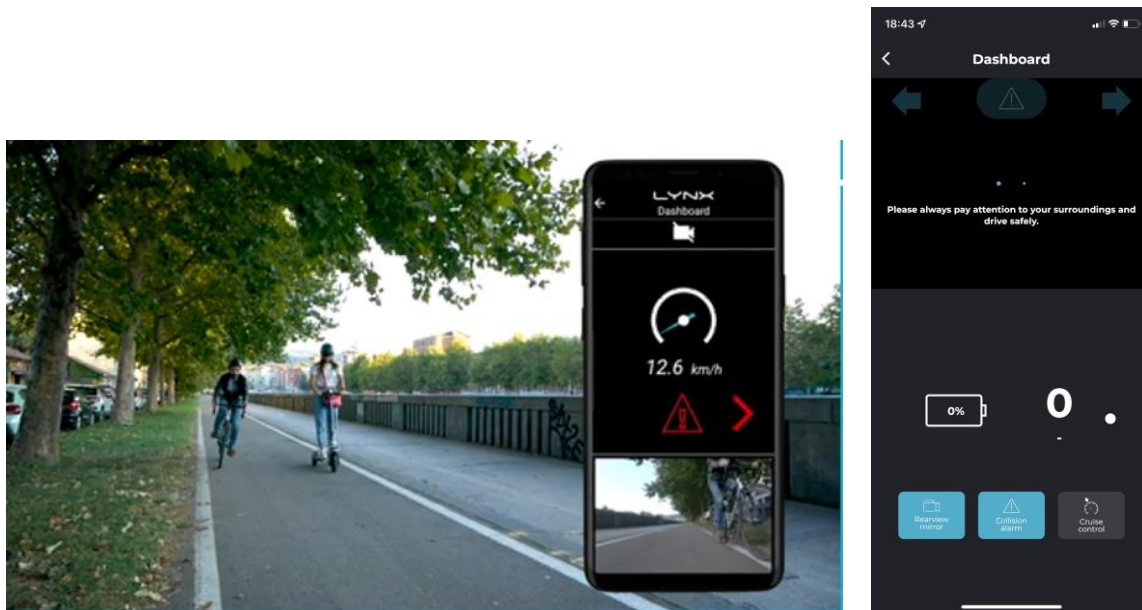
Figure 6 – Example of Safety System (camera based) in action & UI mockup

NAVIGATION SYSTEM

The navigation system that will be integrated into DREEM APP is provided by a third party (Trailze). DREEM APP will exchange the following information with Trailze SDK:

- The best and safest micromobility routes provided by the Trailze Routing API
- Display of real time user progress on map
- Banner instructions - appropriate text and icons for each step of the route
- Voice announcements along the route
- Rerouting when rider goes off-route

The interface allows the user to:
- Search for and choose a destination (geocoding)
- View the proposed route summary and the route steps
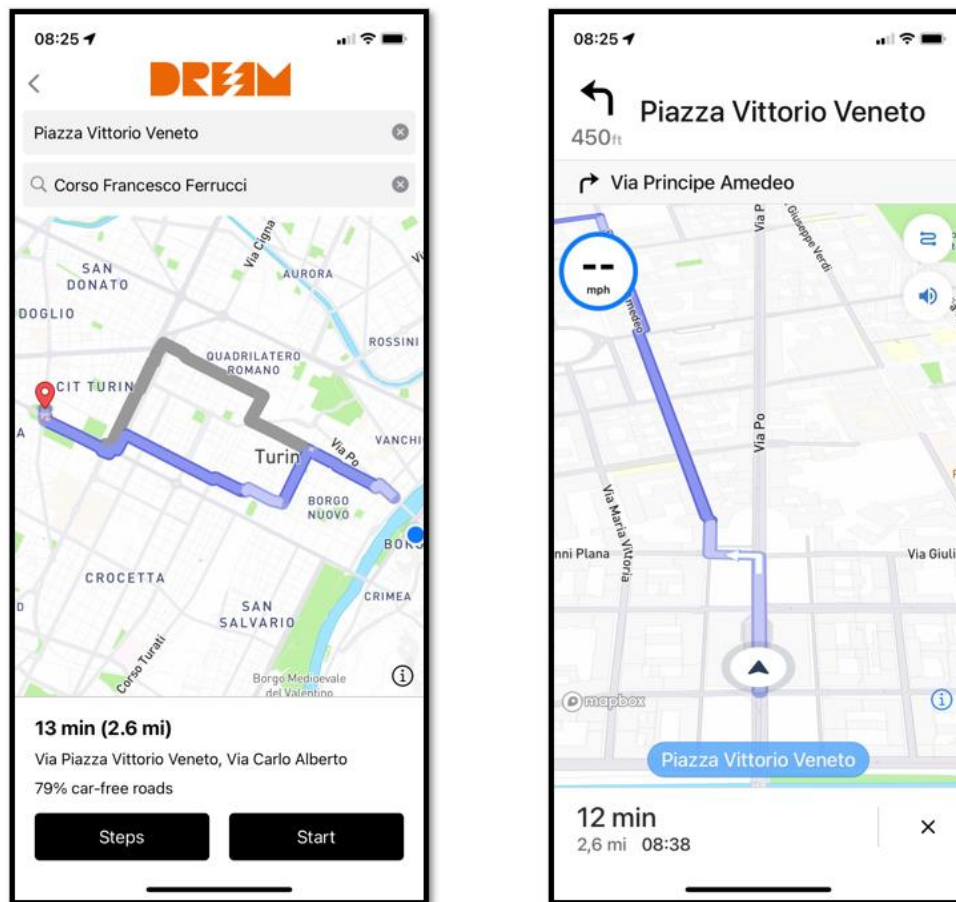- Start the turn by turn navigation experience

Figure 7 - Example of Safety system (Camera based) in action. Optimized Routing & turn-by-turn navigation

The car-free route optimization algorithm is based on bike-lanes data, in order to ensure the safest driving experience to the driver. Typical use case:

A to B route example			
Route	Distance [Km]	Time [minutes]	Percentage of car-free (bike lanes)
A	4.1	15	15%
B	4.8	16	58%
C	9.7	23	89%

The navigation system will provide to the user the possibility to choose among routes A, B and C. Route B and C will be the first two options, leaving to the driver the possibility to choose among a shorter medium-safety level option (B) and a much longer but high-safety option (C). Option A will be available but not suggested, considering risks Vs benefits of that route.

KICKSCOOTER STATUS

The following information are reported:

- Driven distance (total and current trip)
- Connection with scooter active/not active
- Serial number
- Battery Status

KICKSCOOTER SETUP

The following information/commands are reported:

- Name of the scooter
- Automatic shutdown - timer
- Rider Modes (Pedestrian, Eco, Sport)
- Cruise Control ACTIVE/NOT ACTIVE
- Unit of measure (mph/km/h)
- Audio Notification ON/OFF

APP – User feedbacks and insights collection

The APP will be tested among the consortium partner first and then released to all the users that will be part of the three pilots, running in Turin (Italy), Bruxelles (Belgium) and Goteborg (Sweden).

Each pilot will engage around 40 users and we target to gather feedbacks from at least 20 to 30 users on the APP per each pilot. The total amount of users priving feedbacks about their experience with the APP then is around 60 to 90.

Data will be collected via surveys that will be done at the end of each ride or in some specific case collecting the overall experience at the end of the whole driving period (2-3 weeks per user).

Data will be then collected in an anonymized way and then integrated to have clear indications about:

- User interface: easiness to interact and other insights to improve it
- Availability of all the needed features or need for new ones
- Safety during the ride guaranteed by the APP experience
- Issues on connecting to the scooter with the smartphone or connecting the passive safety system (camera based)

Pictures of Mockup version

The following pictures are related to the initial version of DREEM APP mockup, refinements are on-going based on consortium partners feedbacks, additional features to be added (for example the emergency call and the ticketing section) and new adjustments will be implemented as soon as users' feedbacks and insights will be collected.

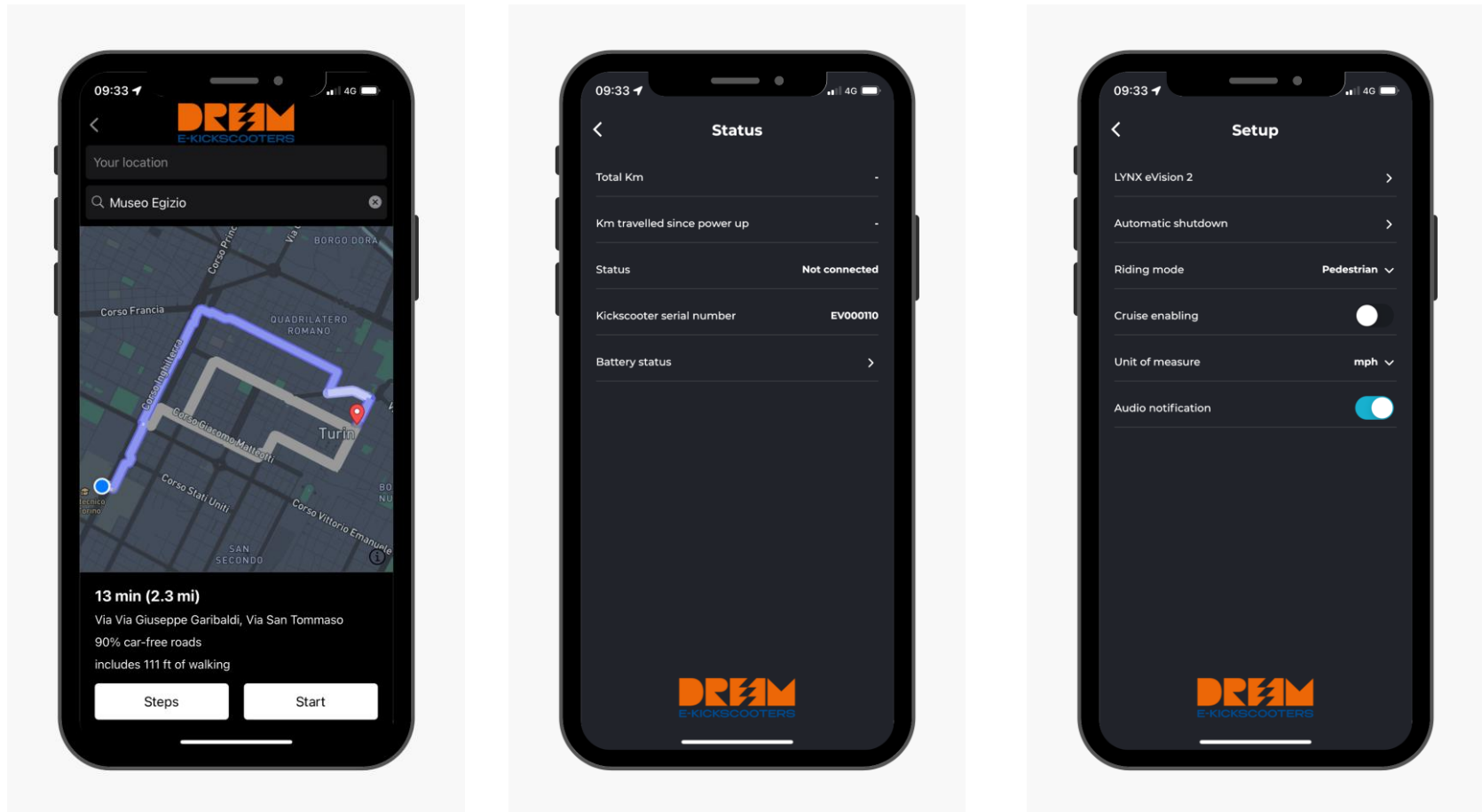Fig. 8 – DREEM APP Mockup: Main Menu, Dashboard and rear digital mirror

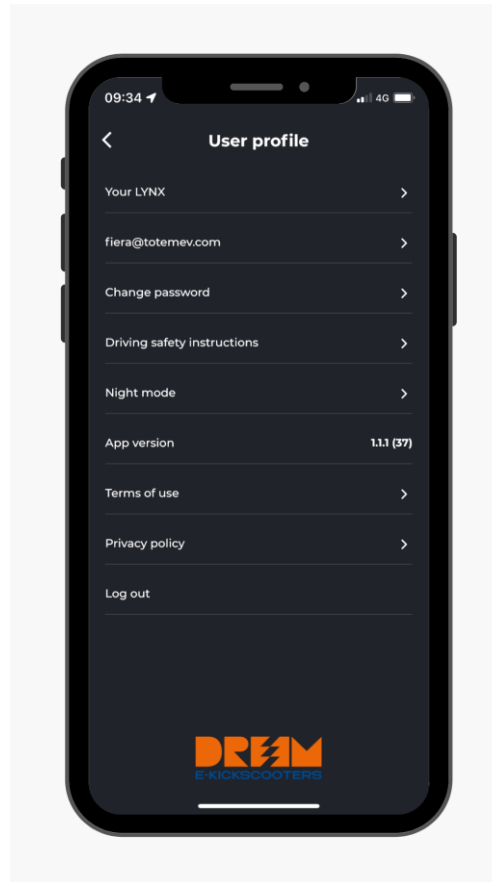Fig. 9 – DREEM APP Mockup: Navigation system, scooter status and scooter setup

Fig. 10 – DREEM APP Mockup: User Profile

PARTNERS