

Smart Convertible (Race/Stationary) Power Generating Bicycle

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I. EXECUTIVE SUMMARY OF THE PROJECT

Smart Convertible (Race/Stationary) Power Generating Bicycle is a human-powered, pedal-driven, single-track Eco-friendly vehicle that is used both outdoors as a race bicycle and indoors as a stationary bicycle (exercise equipment) through a build-in Foldable support that can be used as a safe bumper in “Race Mode” or as a stationary support in “Stationary Mode”. Smart Convertible (Race/Stationary) Power Generating Bicycle contains a dynamo that converts the dynamic energy generated by a human activity either outdoors or indoors and keep it in the bicycle power bank. The Dynamo also serves as a variable resistance to the pedal in the stationary mode. Smart Convertible (Race/Stationary) Power Generating Bicycle is provided also with a magnetic brake attached to the rear wheel to provide a maximum resistance when needed. Apart from the generator, a small solar panel is provided for maximum utilization of the green energy Smart Convertible (Race/Stationary) Power Generating Bicycle is provided with a smart front panel contains USB slots, Power sockets, Led Lamp, MP3 Player. External speakers all connected to the bicycle power bank. Smart Convertible (Race/Stationary) Power Generating Bicycle is provided with location information system that can send location details to a specific phone number when the battery is about to be empty or when the emergency panic button is pushed. In order to indicate the rate of power consumption and rate of electric charging by dynamo Smart Convertible (Race/Stationary) Power Generating Bicycle is provided with a meter that is connected to both dynamo and the front panel Smart Convertible (Race/Stationary) Power Generating Bicycle has the regular vital activity measurements like pulse rate, body temperature and calories burned.

II. HIGHLIGHTING OF THE KEY NOVEL FEATURES COMPARATIVELY TO THE CLOSEST EXISTING SIMILAR PRODUCT

1. Has a build-in foldable support to convert the race bicycle to a stationary one. The build-in Foldable support is used as a safe bumper in the “Race Mode” and as a stationary support in “Stationary Mode”.
2. Contains two types of resistance to promote the exercise equipment at “Stationary Mode”
 - a) First, through the generator “Dynamo” that serves as a variable resistance to the pedal.
 - b) Second, through a magnetic brake attached to the metal frame of the rear wheel and provide adjustable resistance to the exercise equipment.
3. Contains an emergency system that works spontaneously when the battery is about to exhaust and send an SMS and an email containing the GPS coordinates in a Google Maps link to all emergency contacts immediately. The emergency system can work from the smart front panel or through a mobile app. Or both.
4. Contains a smart front panel that contains USB slots, Power sockets, Led Lamp, MP3 Player, Speaker and Meter to estimate the power consumed and generated.

III. ASSESSMENT OF THE INNOVATIVE PRODUCT TARGET MARKET

3.1 Assessment of the innovative product target market

3.1.1 Benefit of The Innovation:

- a) Ensure healthy lifestyle through encourage people to exercise indoors/outdoors using the same equipment.
- b) Ensure sustainability, by providing a green source of energy through utilizing the dynamic energy generated by the pedal either at the “Race Mode” or at “Stationary Mode” into electricity as well as from the solar panel and keep it in the bicycle battery or power storage.
- c) Ensure the rider safety through the emergency system that works spontaneously when the battery is about to exhaust and send an SMS and an email containing the GPS coordinates in a Google Maps link to all emergency contacts immediately.

3.1.2 Target Market:

Mass Market.

3.2 Details of The Project Design with Technical Specifications, Drawings and Characteristics

3.2.1 Detailed description of the Smart Convertible (Race/Stationary) Power Generating Bicycle

Figures (1) and (2) show the Race Mode and Stationary Mode of Smart Convertible (Race/Stationary) Power Generating Bicycle. Arrows (1) and (2) refer to the front and rear build-in foldable support that is used to convert the bicycle from the race mode to the stationary mode and vice versa. The Power Case (3) contains the built-in generator “Dynamo” that converts the dynamic energy generated by the pedal either at the “Race Mode” or at “Stationary Mode” into electricity and keep it in the bicycle battery or power storage. It also contains a built-in battery to store the generated power. The dynamo that is located in the Power Case (3) serves as a variable resistance to the pedal to promote the exercise equipment at “Stationary Mode”. The “Stationary Mode” is also provided with magnetic brake(4) attached to the rear wheel to provide extra adjustable resistance to the exercise equipment. Small solar panel (5) for maximum utilization of the green energy is connected to the head tube of the bicycle.

The smart front panel(6) contains USB slots, Power sockets, Led Lamp, MP3 Player, Speaker and Meter to estimate the power consumed and generated. The front panel also contains an emergency system that works spontaneously when the battery is about to exhaust and send an SMS and an email containing the GPS coordinates in a Google Maps link to all emergency contacts immediately. The emergency system can work from the smart front panel or through a mobile app. Or both.

Figure (3) shows the foldable support that is used to convert the race bicycle to a stationary one. It is used as a safe bumper in the “Race Mode” and as a stationary support in “Stationary Mode”. the foldable support consists of a pair of stainlesssteel Side Stands (1) ends with bumper of Synthetic/Natural rubber with gripping surface (2) The foldable support is connected to body of bicycle through Flange Nut (4). Tension Spring (3) is to fold the foldable support to either up “Race Mode” or down “Stationary Mode”



Figure 1: Stationary Mode (Supports UP) of Genius Outdoor/Indoor Electric Generating Bicycle

1. Front build-in Foldable support
2. Rear build-in Foldable support
3. Power Case contains the built-in generator “Dynamo “and Battery.
4. Magnetic Brake
5. Solar Panel
6. Smart Front Panel

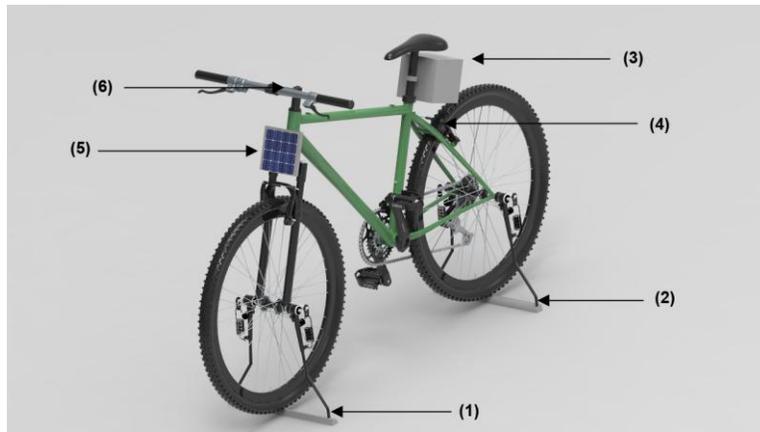


Figure 2: Stationary Mode (Supports Down) of Genius Outdoor/Indoor Electric Generating Bicycle

1. Front build-in Foldable support
2. Rear build-in Foldable support
3. Power Case contains the built-in generator “Dynamo “and Battery.
4. Magnetic Brake
5. Solar Panel
6. Smart Front Panel

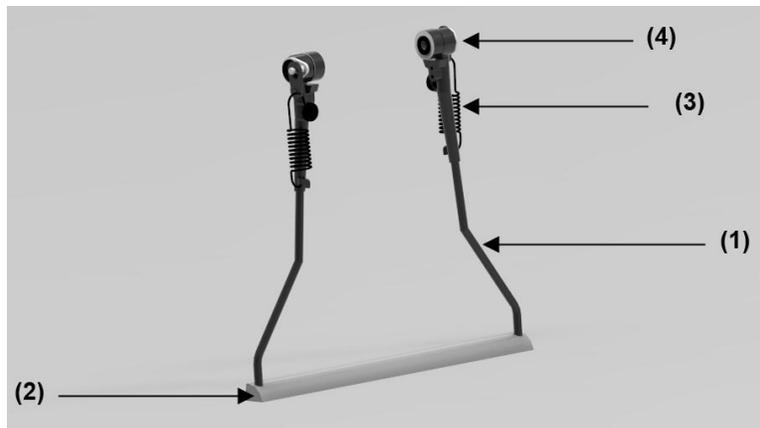


Figure 3: Foldable support (Front and Rear)

1. Stainless-steel Side Stand
2. Bumper from Synthetic/Natural rubber with gripping surface
3. Tension Spring
4. Flange Nut

3.2.2 Detailed description of the electric and circuit diagrams of Smart Convertible (Race/Stationary) Power Generating Bicycle

Smart Convertible (Race/Stationary) Power Generating Bicycle has three main circuits; Solar power circuit (Figure 4), Dynamo circuit (Figure 5) and Arduino based Bicycle Tracker using GPS and GSM/MP3/Led (Figure 6). The bicycle braking system by magnetic break is shown in (Figure 7), and all circuits are integrated together in the Final Circuit Design (Figure 8).

IV. SOLAR POWER CIRCUIT:

The solar power circuit below is aimed at generating power to charge the battery. the size of the solar will be up to you as it is highly affected by where its used. The diodes in this circuit prevent backflow of power to the solar panel in the dark where it will not be generating. The voltage regulator LM7805 is used to ensure that the battery is charged at a constant voltage of 5V. In case you get a voltage above 5V rating, the voltage regulator LM317T may be used as it has a wide range of output voltage. The capacitor acts as a smoothing capacitor.

Terminal diode is used to protect the LM7805 and panel from reverse voltage generated by the battery when it is not charging.

Circuit Components:

- Solar panel – 5V
- LM7805 voltage regulator
- DC battery
- Diode – 2 x 1N4007
- Capacitor – 2x10uF

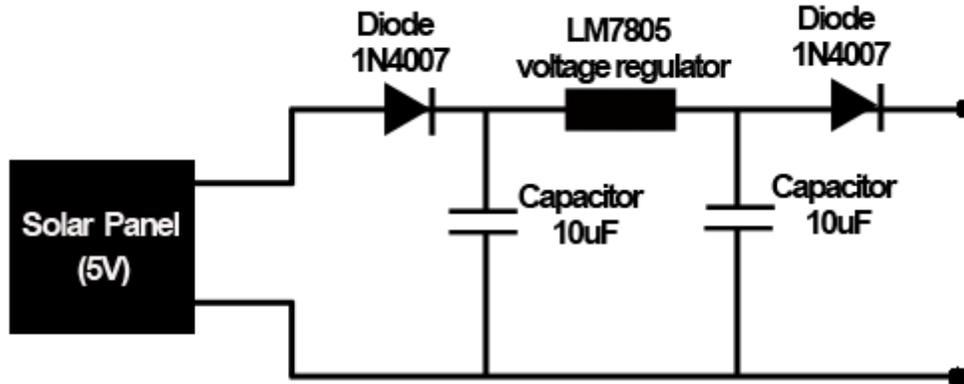


Figure 4: Solar power circuit

V. DYNAMO CIRCUIT:

A dynamo generates a sinusoidal waveform. The bridge rectifiers are used to convert the sinusoidal output into a pulsating DC power. The 10uF capacitor is a smoothing capacitor which reduces the ripples in the resulting DC power. The voltage regulator LM7805 is used to ensure a constant 5 V is used to charge the battery. The terminal diode 1N4007 prevents discharge of power in the battery through the diode when the bicycle is not moving.

Components:

- Full bridge diodes – 5 x 1N4007
- Capacitors – 2 x 10 uF
- LM7805 voltage regulator
- Dynamo generator

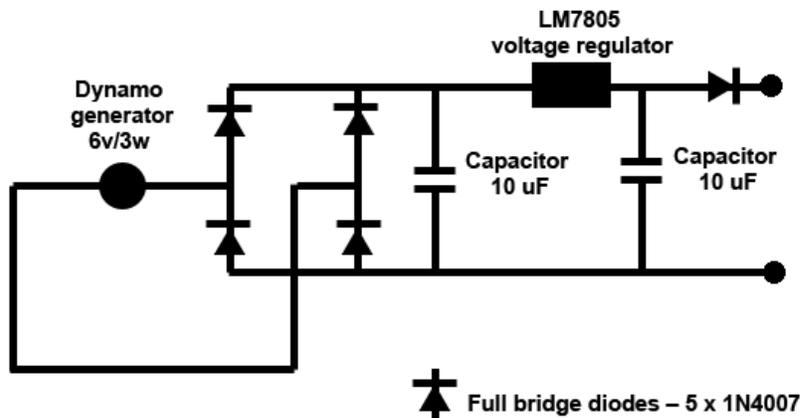


Figure 5: Dynamo circuit

5.1 Arduino based Bicycle Tracker using GPS and GSM and other auxiliary features

The battery is used to power the active components in this stage. In this project, Arduino is used for controlling whole the process with a GPS Receiver and GSM module. GPS Receiver is used for detecting coordinates of the vehicle, GSM module is used for sending the coordinates to user by SMS. And an optional 16x2 LCD is also used for displaying status messages or coordinates. We have used GPS Module SKG13BL and GSM Module SIM900A.

Components:

Arduino
GSM Module
GPS Module
16x2 LCD
Power Supply
Connecting Wires
10 K POT

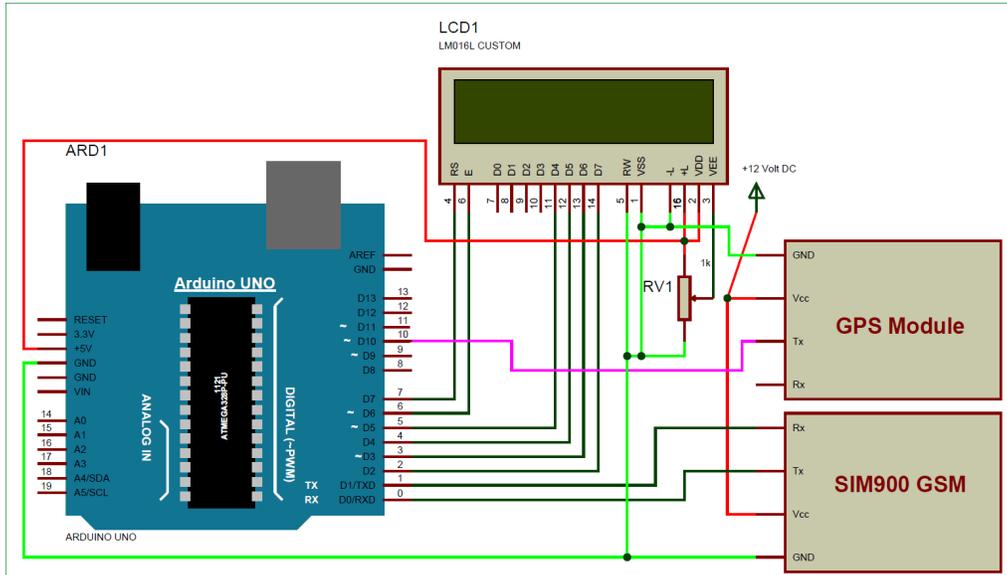


Figure 6: Arduino based Bicycle Tracker using GPS and GSM and other auxiliary features

5.2 Bicycle Braking System using Magnetic Break

The Genius Outdoor/Indoor Electric Generating Bicycle has strong magnets attached on the rim such that when current runs through the electromagnets as indicated in the diagram the magnets are attracted thus creating a pulling effect on the wheel.

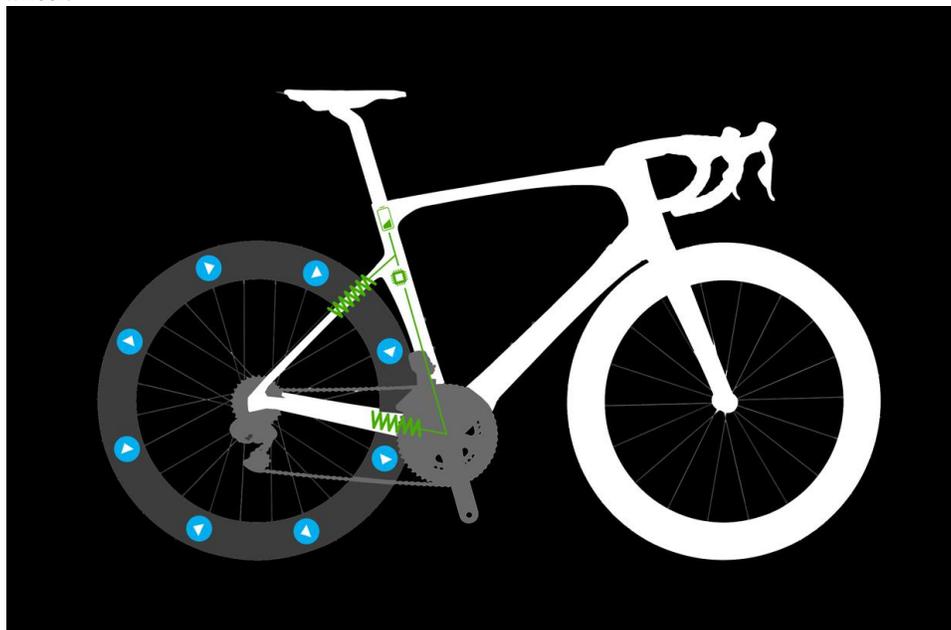


Figure 7: Bicycle Braking System by the Magnetic Break

VI. FINAL CIRCUIT DESIGN

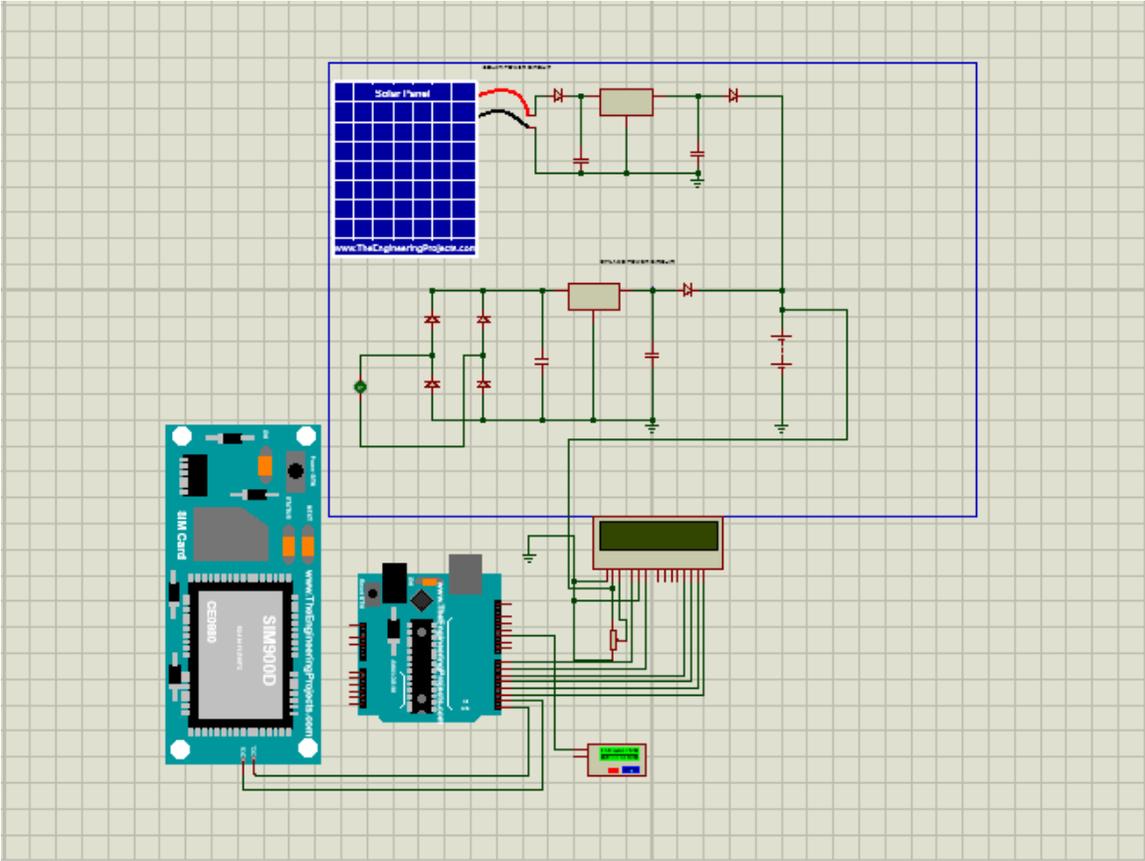


Figure 8: Final Circuit Design