



E-BIKE CHARGING & DOCKING STATION

NEEDS & REQUIREMENTS

BRYAN CASTRO
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SEVE KIM
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BILAL RAFIQ



THE DESIGN TEAM



SEVE KIM

ECE Team Leader

- Delegate task to ECE team
- Manage work and oversee progress
- Ensure scheduling corresponds with all members

Technical Area: Microcontroller programming & design

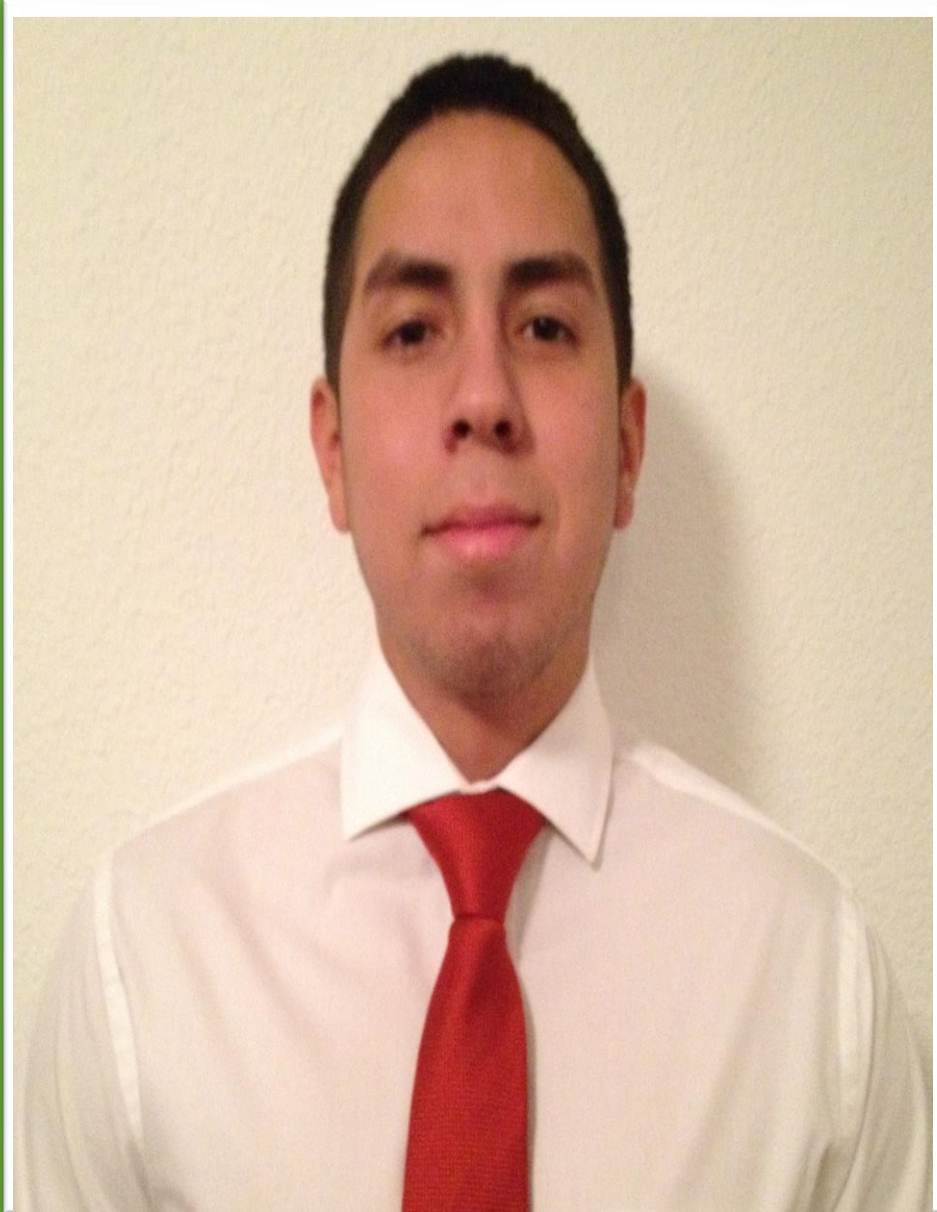


BILAL RAFIQ

ME Team Leader

- Delegate task to ME team
- Assist in communication amongst team members
- Guide team to follow requirements & meet deadlines

Technical Area: Mechanical systems specialist



BRYAN CASTRO

Financial Advisor

- Allocate funds to needs & specifications of client
- Plan & set budget for cost-efficiency
- Keep track of itemized list of costs

Technical Area: Power & electronic systems specialist



JACOB KNOBLAUCH

Team Coordinator

- Responsible for contacting all faculty, advisors, board of reviewers, & project sponsors
- Keep meeting minutes
- Manage all documentation

Technical Area: Coding specialist



JUSTIN JOHNSON

General Assistant

- Check and proof read all material before submission
- Fill in position for any absent or incapable of their duty
- Provide materials & outsourcing for project

Technical Area: Virtual model specialist



PROBLEM STATEMENT

Efficient Systems, LLC Electric Bicycles (E-Bike)

Dually purposed station:

Charging & docking e-bikes

Features

Minimal user interaction

Charges at a fast rate

Locking mechanism

BACKGROUND

- Efficient Systems, LLC
 - Tallahassee start-up
 - Partners in South America
 - 3 current operational E-bike sharing programs

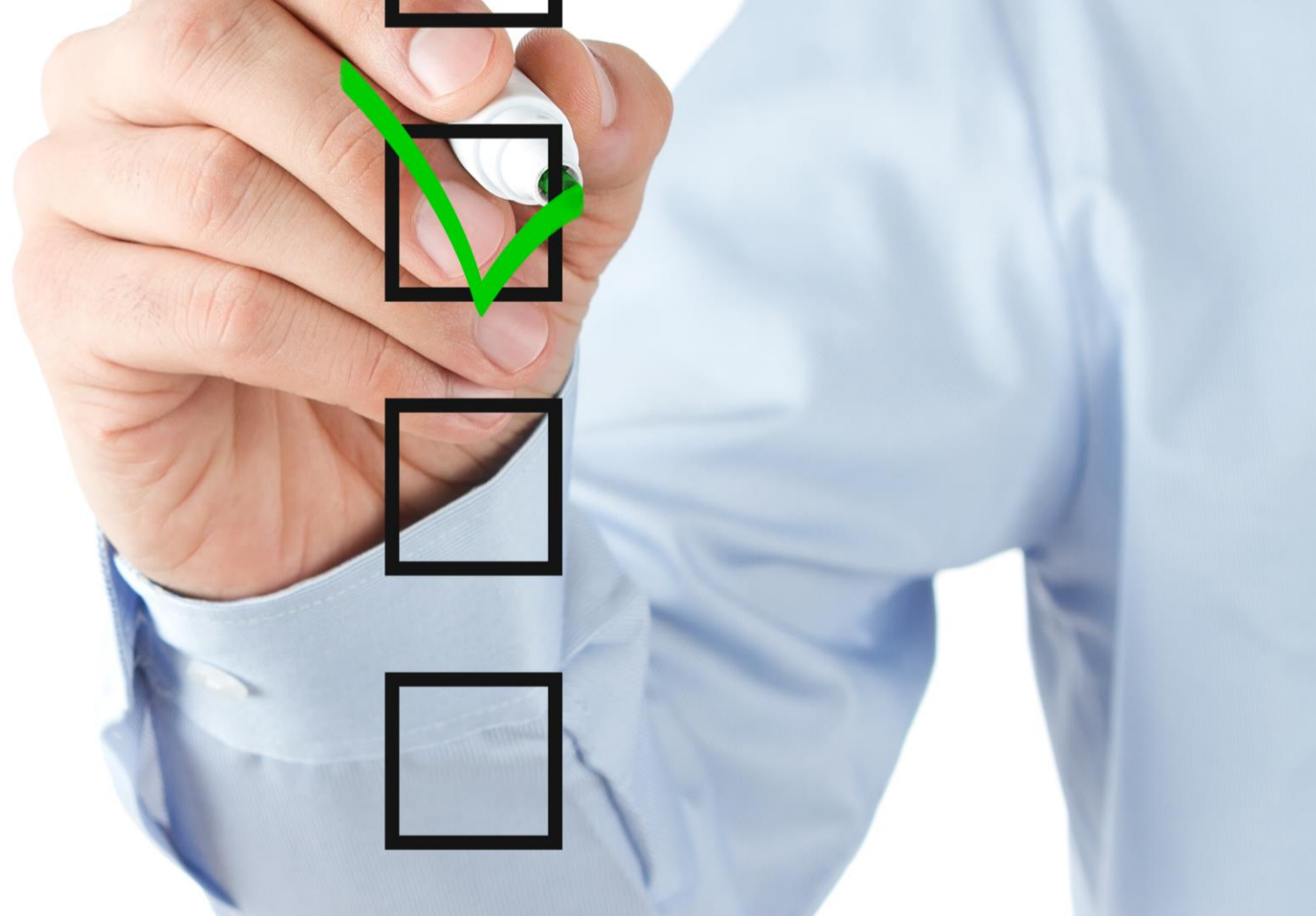
Efficient Systems

Because it makes sense!



REQUIRED CAPABILITIES

- CAP-0001: The station must charge the electric bicycle by resonance or induction
- CAP-0002: Must be protected by weathering conditions
- CAP-0003: The station should dock the electric bicycle in place
- CAP-0004: The station must have locking capability
- CAP-0005: The station should be easy for the user dock and undock the bicycle with minimal use
- CAP-0006: The station should have a modular and attractable design and be cost efficient



REQUIREMENTS

FUNCTIONAL REQUIREMENTS

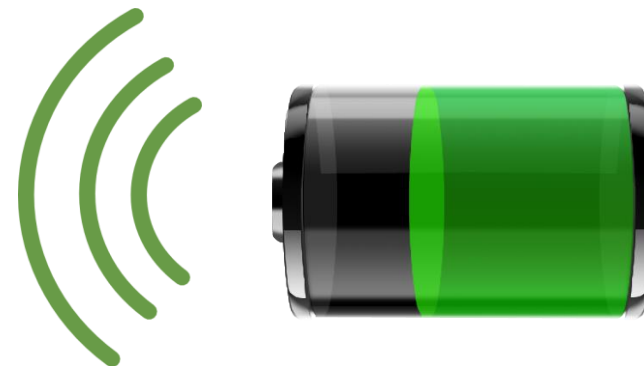
AUTOMATIC LOCKING MECHANISM

- Base frame: could be existing product or custom design
- Could lock onto bike frame or back wheel
- Possibilities: Clamp, magnetic lock



CHARGE FULLY WITHIN 3-4 HOURS

- Induction or resonance will be used if at all possible
- Induction adapter or other connection must be removable



FUNCTIONAL REQUIREMENTS

- USER INTERFACE

- LEDs
- LCD/OLED display
- Mobile device integration

- MODULAR DESIGN

- Number of docks can be changed to meet customer's needs

NON-FUNCTIONAL REQUIREMENTS

- It is very important that the design be cost efficient
- The design must be customizable so that it may be changed easily in the future
- A compact design is needed that will fit as many charging docks that can fit in the designated size area

NON-FUNCTIONAL REQUIREMENTS

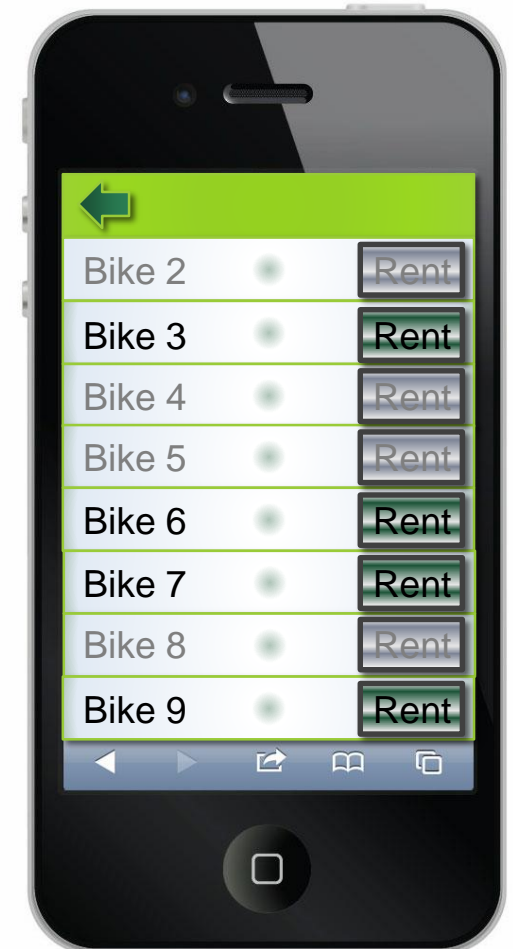
- The final design should be aesthetically pleasing and be well built
- Design must be weather resistant
 - Rain, hail, sleet or snow

CONSTRAINTS

- Cost
 - Cannot be much higher than already existing option
- Cannot be overly complicated
 - Variety of users using the product

INTERFACE REQUIREMENTS

- Must interface between user and local/remote database
- User portion can be as simple as LED indicators
- If mobile interface, remote database will be needed
 - Network capabilities



OPERATING ENVIRONMENT

- The final design should be able to work at normal and slightly less or more than normal temperatures
 - 20° F – 110° F
- Should remain optimal at high humidity levels
- Vibration also needs to be taken into account to some level
 - Parking lots and high traffic areas



PRELIMINARY TEST PLAN

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CAPABILITIES TEST PLAN

Induction/Resonance Charging Test

- E-Bike will be placed in station
- No metal to metal contact
- Fully charge in less than 4 hours
- No damage shall result

E-Bike Docking Test

- Tire will be placed into tire mount
- E-Bike should stand alone and upright
- Minimal movement after being docked
- Bicycle can be easily removed after interacting with interface

PRELIMINARY TEST PLAN

CAPABILITIES TEST PLAN

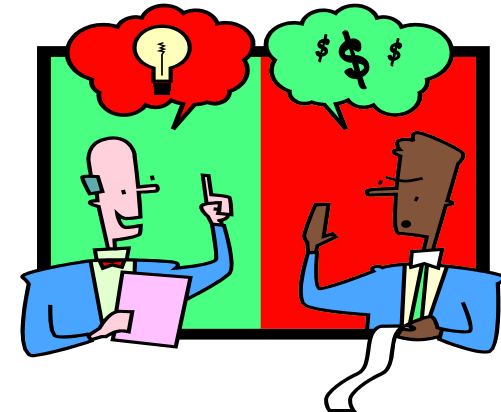
Locking Test

- Bicycle will immediately lock when mounted
- Apply push/pull force to test anti-theft design
- Station's interface will unlock bike position
- Locking mechanism will remain unlocked until next interaction



Attractive & Cost Efficient

- Prototype will be analyzed for sleek and modern day design
- Design should be built under budget
- Can be multiplied and tied into a series of stations



PRELIMINARY TEST PLAN

REQUIREMENTS TEST PLAN

Functional Requirements Testing

- Automatic locking
- Charging test
- User interface test
- Modular design test

Non-Functional Requirements Testing

- Cost efficiency
- Customizable
- Attractive
- Compactness
- Protection from weathering

PRELIMINARY TEST PLAN

Constraints Test Plan

- ❑ Cost Efficiency
 - \$1,000 Budget
 - Cheaper than current designs.
- ❑ Simplicity of Interface
 - Should be usable by everybody.
 - Either mobile device or electronic display to purchase/activate.

Interface requirements Test

- ❑ Communication To User
 - Charge completion and Lock/Unlock identifiers.
- ❑ Networking
 - Activation to unlocking time should be minimized.
 - Data connectivity of station



PRELIMINARY TEST PLAN



Operating Environment Test

Operating Temperature

- Between 20 – 110 °F (–6 – 43 °C)
- Electrical components release heat to environment.

Weathering

- Rain, heavy winds, flooding, and force of impact of vegetation and other rubble.
- Metal housing will be grounded and not over heat.

Other Factors

- Vibration, high traffic, attempted theft, user misuse, etc.

SUMMARY

- ❑ Efficient Systems LLC is a startup company that wants to expand their success from Bogota, Colombia to the United States.
- ❑ Design and build charging and locking station that users can easily access with minimal interaction.
 - ✓ Using induction or resonance to charge with the quickest time.
 - ✓ Easy docking and locking station to protect from theft.
 - ✓ Minimal user interaction.
 - ✓ Modular and cost efficient design.
 - ✓ Rigid and protective structure.
 - ✓ User interface should be simple and fast.
 - ✓ Aesthetically pleasing design.



QUESTIONS?