Transilvania University of Brasov, Romania,

Future vehicle from recycled materials using green energy

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Dr. Petrică COTFAS

Student:
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Introduction

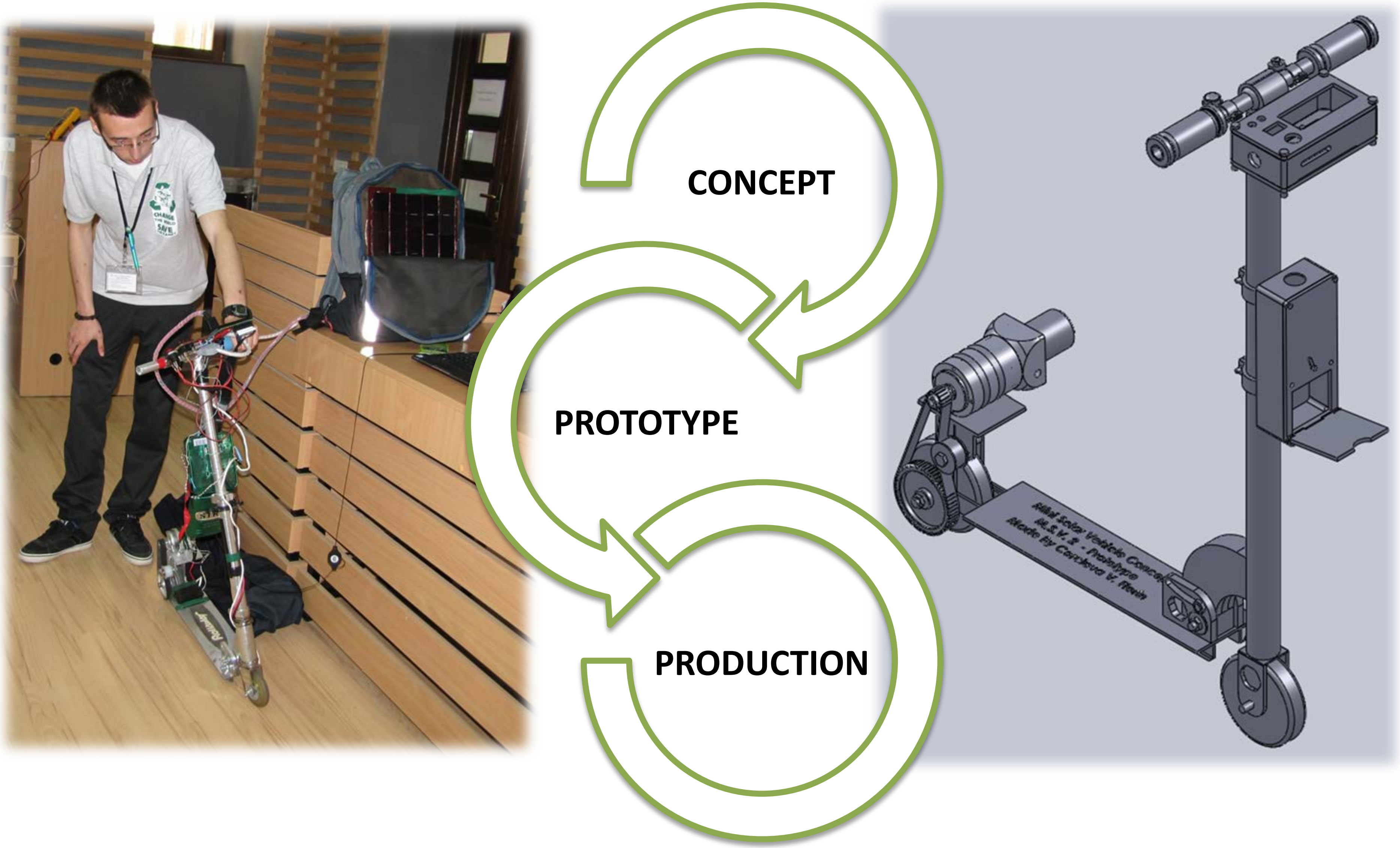
- What we need from a vehicle?
- What is the goal?
- Description
- Software/Hardware
- Demo
- Future development

What do we need from a mini vehicle today?

- To move rapidly outside and inside buildings
- Zero pollution
- Occupy less parking space
- To be easy to maintain
- To use green energy
- To be reliable
- Does not require driving license

Can a vehicle have all these qualities?

Yes, the new M.S.V.2



CONCEPT

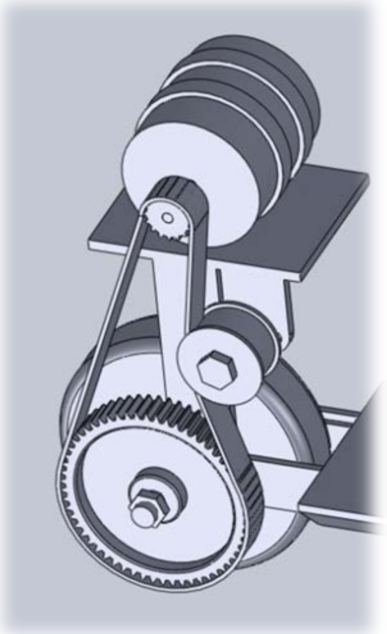
PROTOTYPE

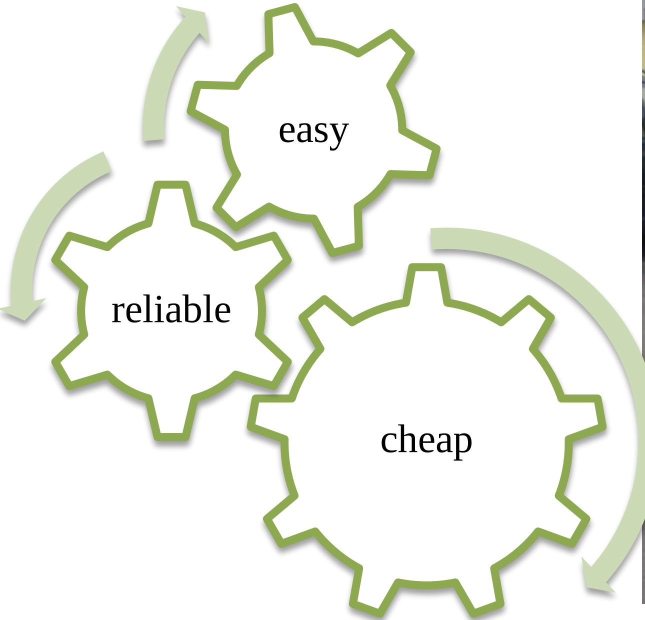
PRODUCTION

What is the goal?

- Cheap (used open source software) (*linux ubuntu 12.4*, *arduino software*, *etc*.)
- Easy to maintain
- Easy to understand
- User friendly
- Eco friendly
- Recycled materials
- Electrical Personal Vehicle

Advantages



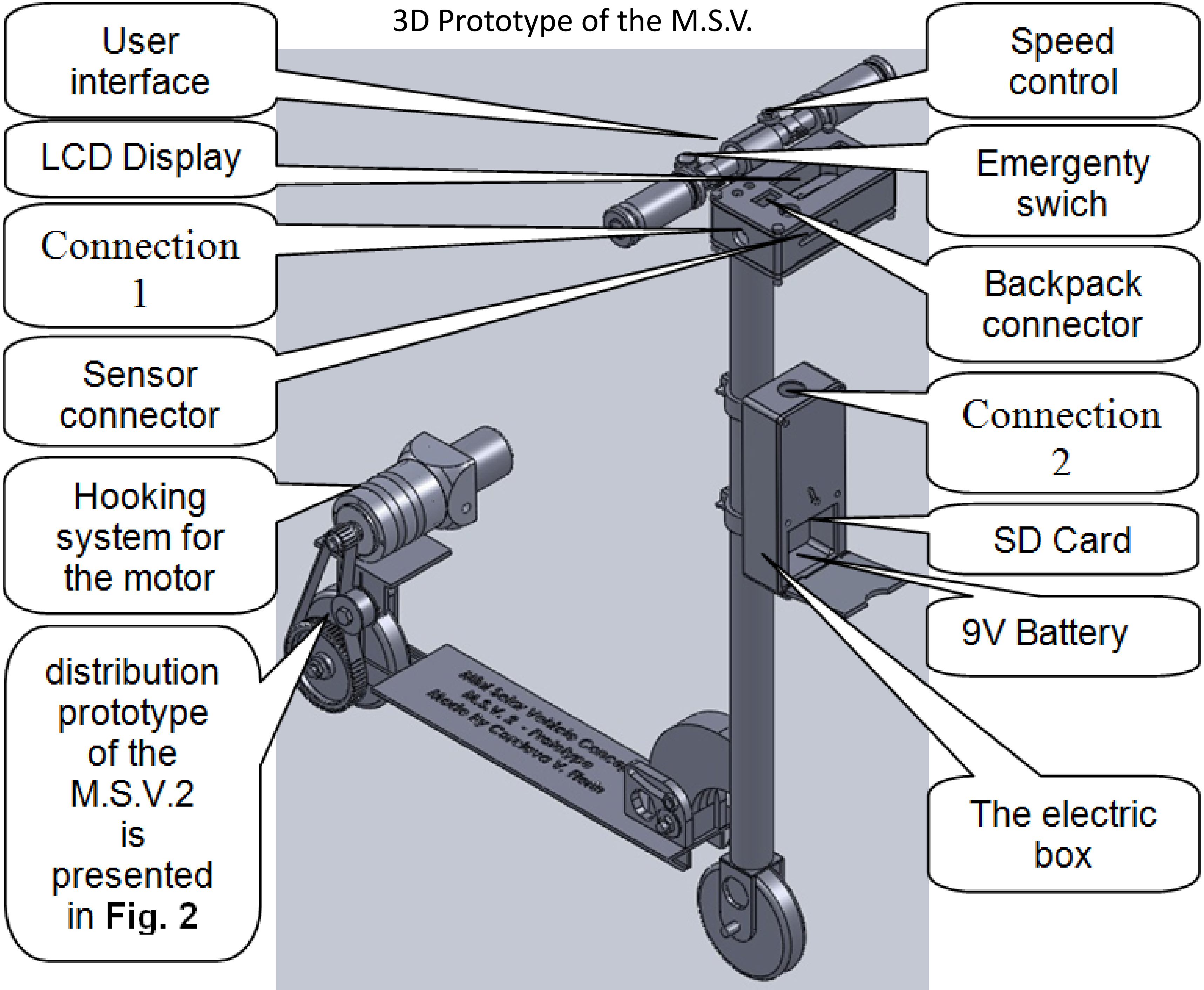


First picture of the frame

First test inside a building

First test outside

3D Prototype of the M.S.V.



User interface

LCD Display

Connection 1

Sensor connector

Hooking system for the motor

distribution prototype of the M.S.V.2 is presented in **Fig. 2**

Speed control

Emergenty swich

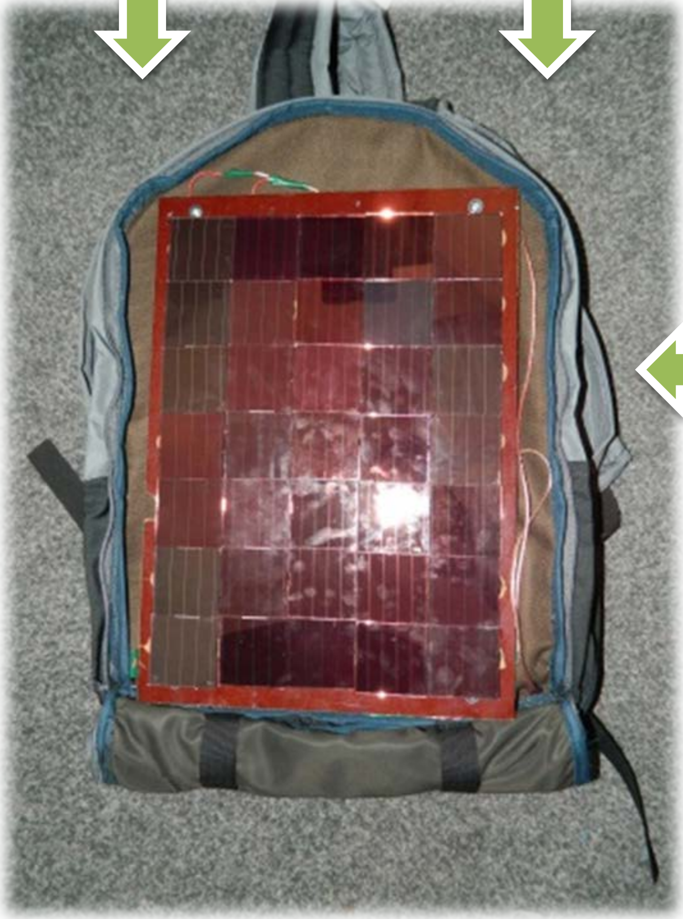
Backpack connector

Connection 2

SD Card

9V Battery

The electric box



Backpack

The backpack has cleverly placed pockets.
There are protection layers between pockets
and a reflective surface for safety at night.
The total weight of the backpack is 6 kg.

The photovoltaic panel

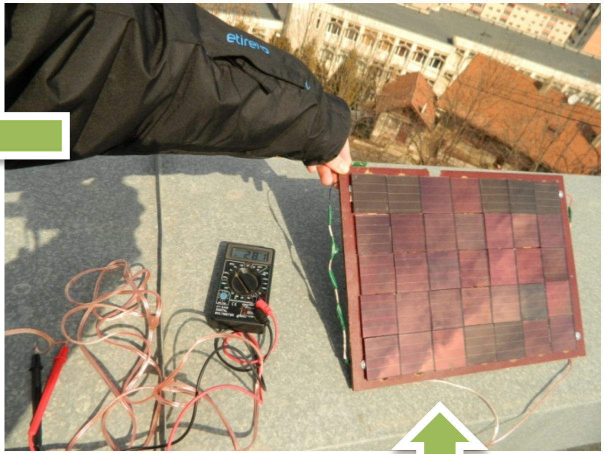
Made of 100% Recycled materials.

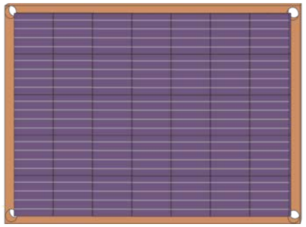
Solar cells parameters:

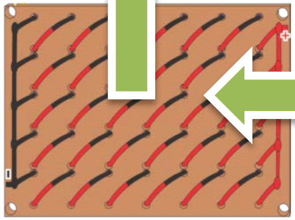
Isc –0.15 A, Imax 0.13A, Voc 4.2V, Vmax 3.75 V.

PV Panel parameters:

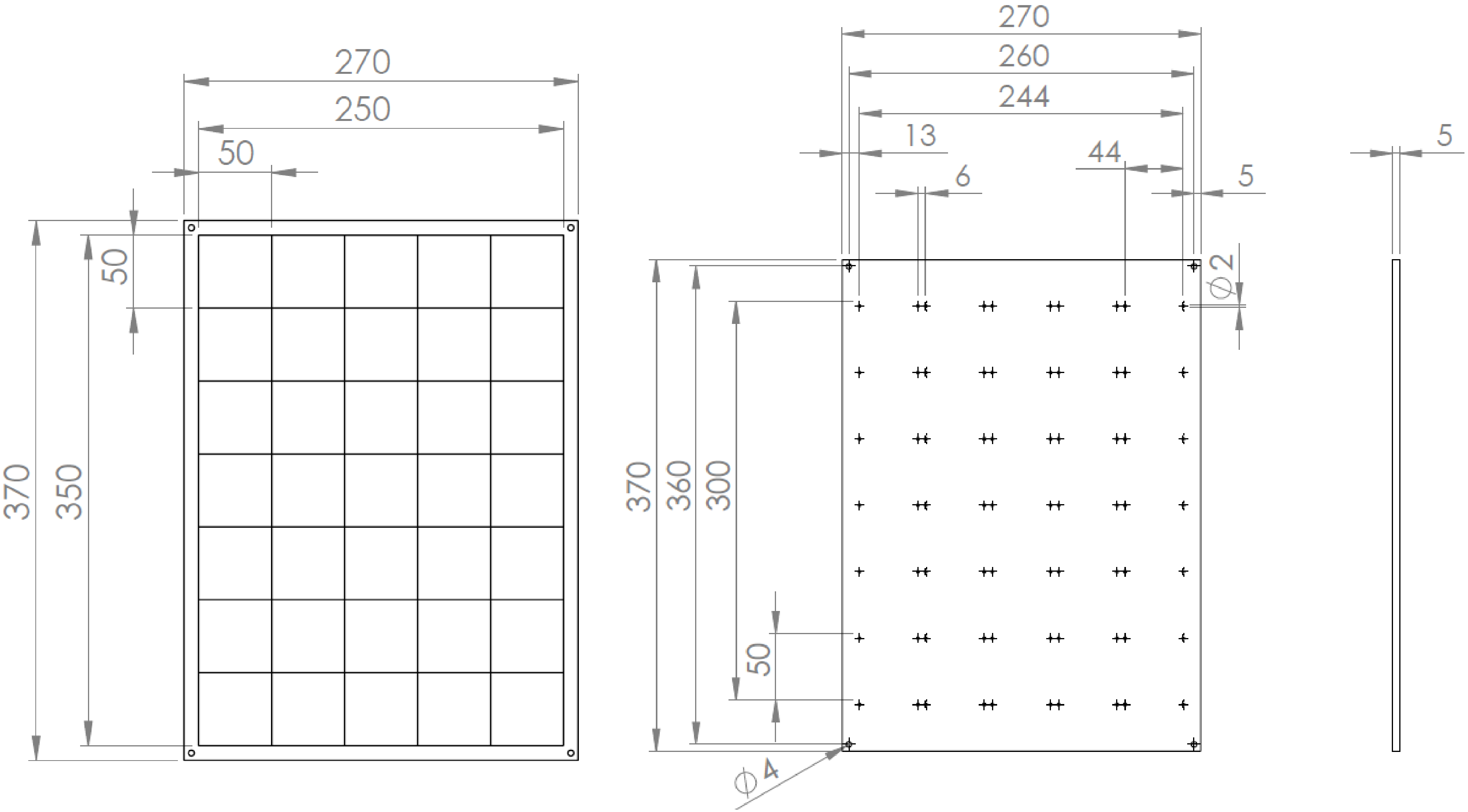
28.1V and the short circuit current is 350mA



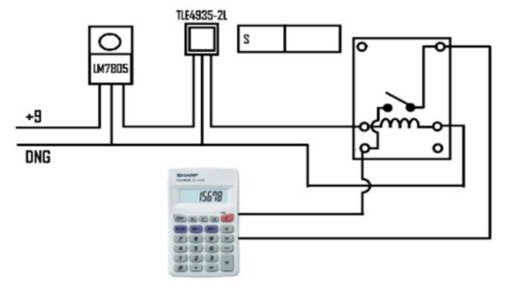




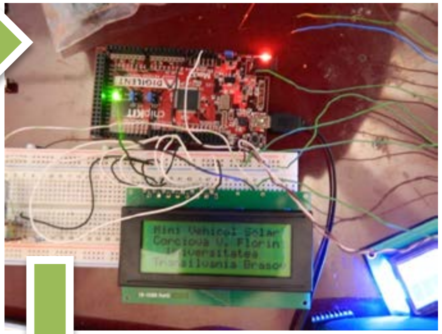
Technical drawing of the Solar panel

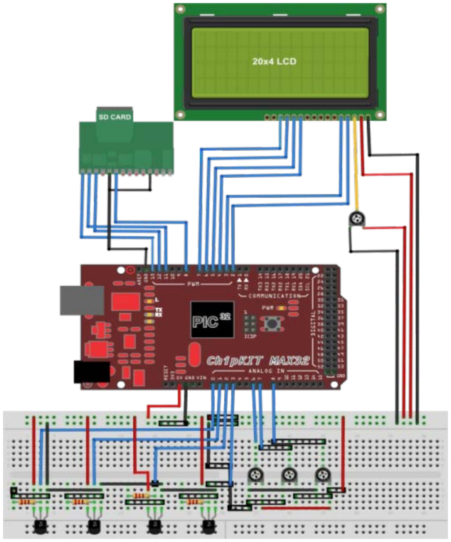


User interface

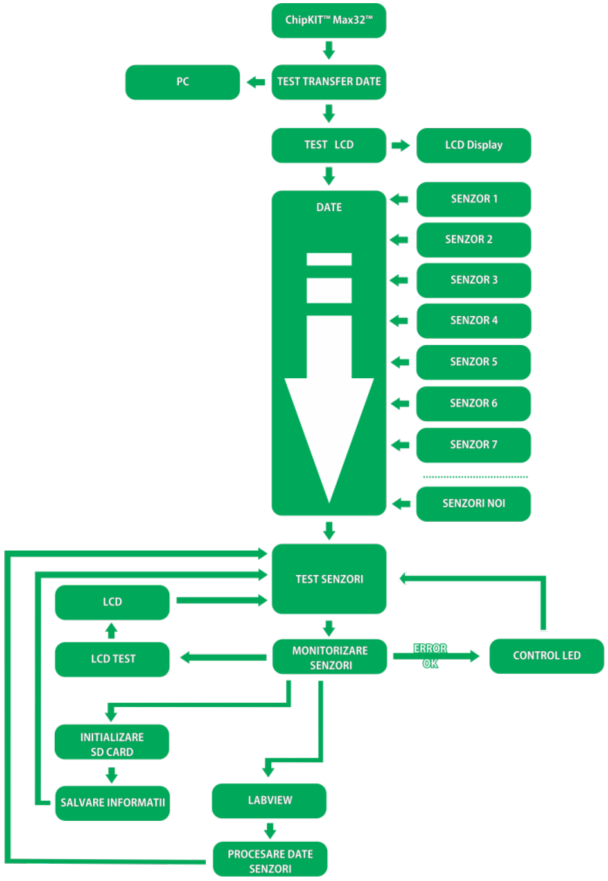


100% Recycled
Components:
Pocket calculator
Reley
Tension regulator of 5V
9V Battery
Magnetic sensor
Magnet





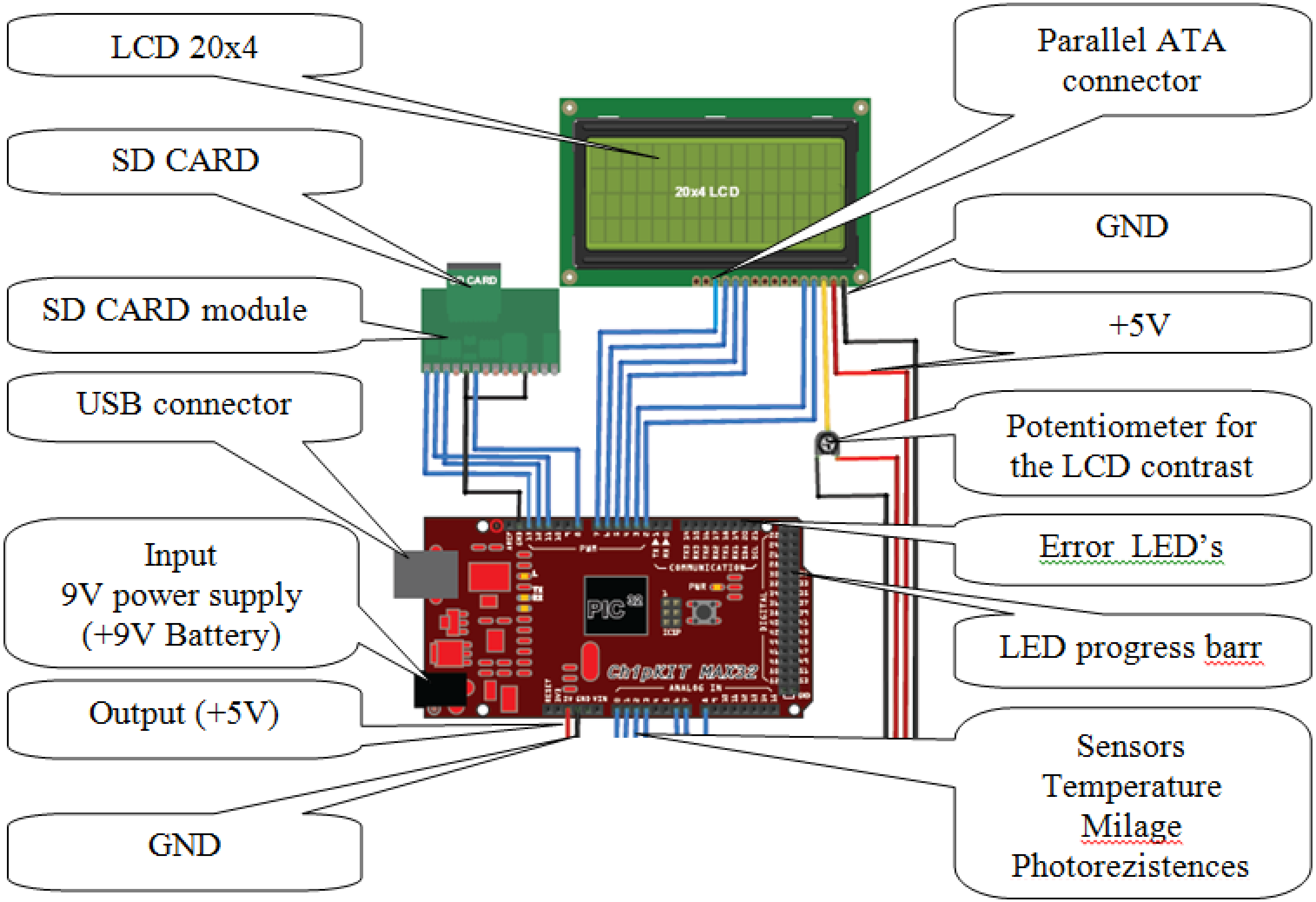
Software logic for the M.S.V.2



ChipKIT™ Max32™
TEST TRANSFER DATE
PC
TEST LCD
LCD Display
DATE
SENZOR 1
SENZOR 2
SENZOR 3
SENZOR 4
SENZOR 5
SENZOR 6
SENZOR 7
SENZORI NOI
TEST SENZORI
LCD
LCD TEST
MONITORIZARE SENZORI
ERROR OK
CONTROL LED
INITIALIZARE SD CARD
SALVARE INFORMATII
LABVIEW
PROCESARE DATE SENZORI

The program can be improved by adding more sensors to monitor parameters. The current system is designed on a KIT CHIP MAX32.

Hardware



LCD 20x4

SD CARD

SD CARD module

USB connector

Input
9V power supply
(+9V Battery)

Output (+5V)

GND

Parallel ATA
connector

GND

+5V

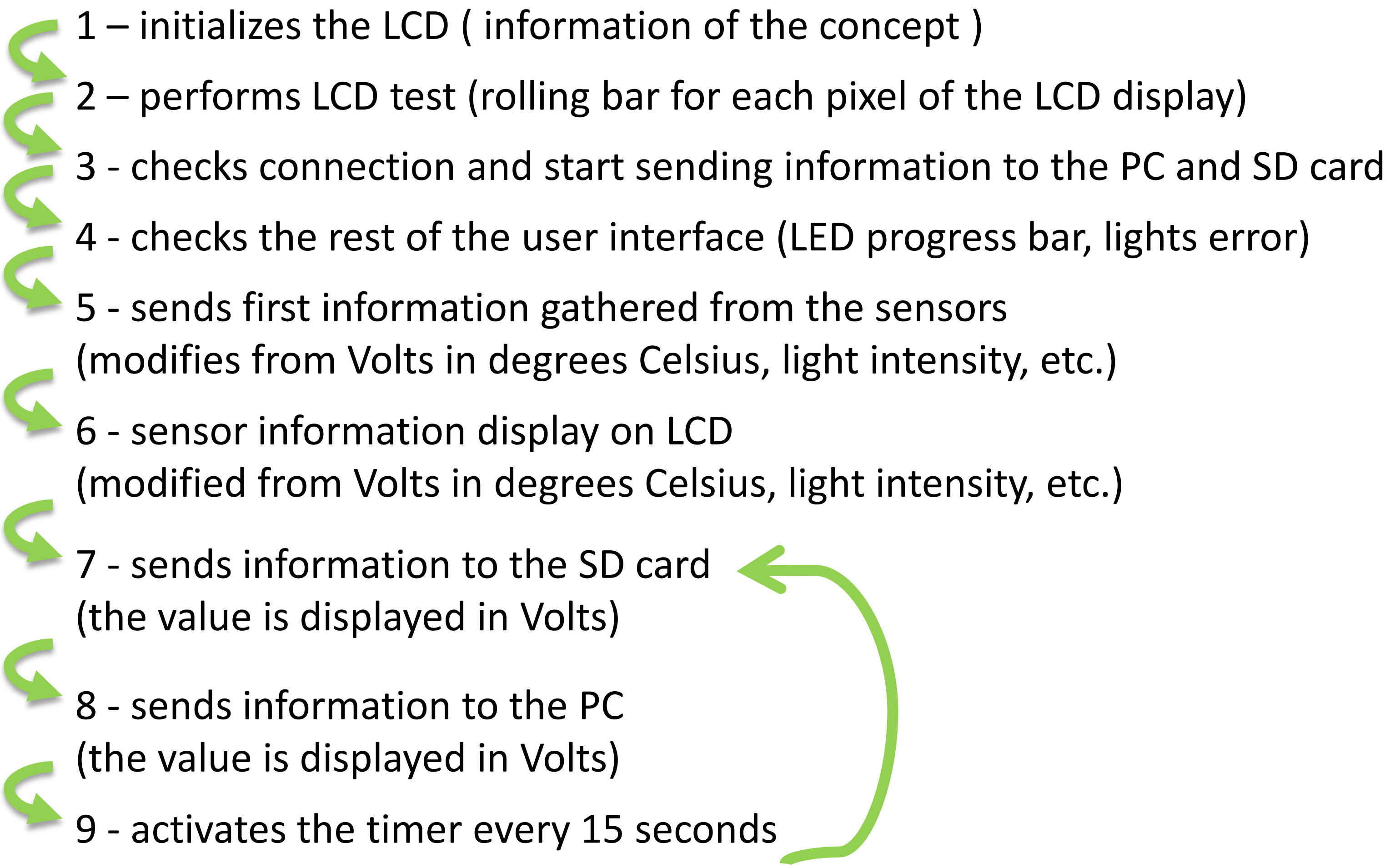
Potentiometer for
the LCD contrast

Error LED's

LED progress barr

Sensors
Temperature
Milage
Photorezistences

Software



1 – initializes the LCD (information of the concept)

2 – performs LCD test (rolling bar for each pixel of the LCD display)

3 - checks connection and start sending information to the PC and SD card

4 - checks the rest of the user interface (LED progress bar, lights error)

5 - sends first information gathered from the sensors
(modifies from Volts in degrees Celsius, light intensity, etc.)

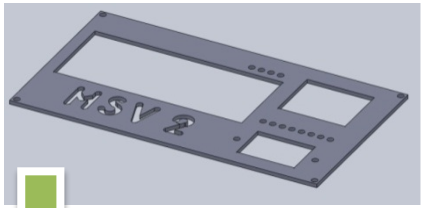
6 - sensor information display on LCD
(modified from Volts in degrees Celsius, light intensity, etc.)

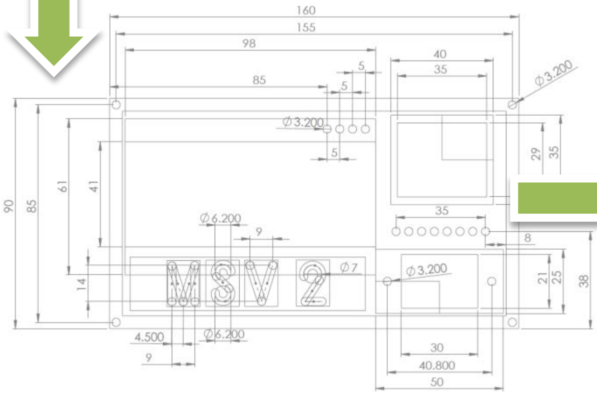
7 - sends information to the SD card
(the value is displayed in Volts)

8 - sends information to the PC
(the value is displayed in Volts)

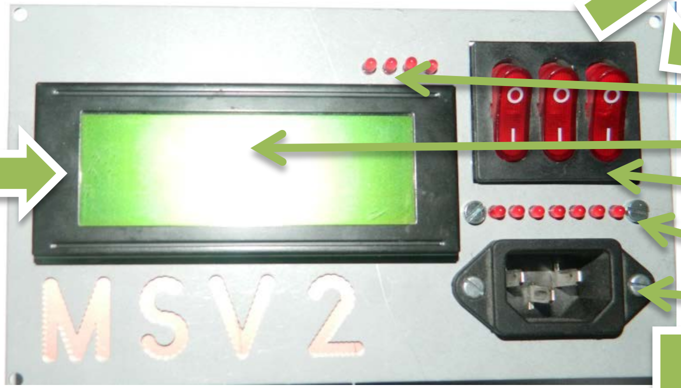
9 - activates the timer every 15 seconds

From concept to reality





Technical drawing



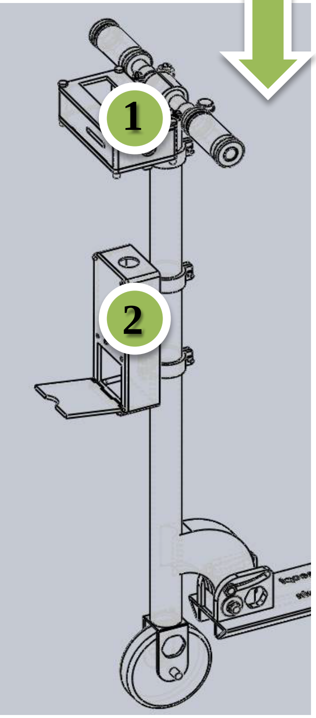
System Errors
LCD display 20x4
ON/OFF switch
LED progress loading bar
Power supply connector

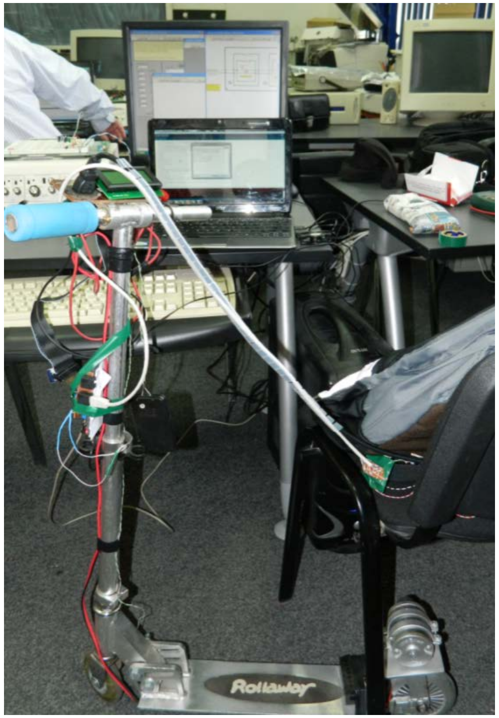
The new housing was created using a punching machine, Euromac BX AUTOINDEX 1000/30, located in the “V” building of Transilvania University. This was created during the “Innovative cold plastic deformation technologies” laboratory.

Prototype of M.S.V.2 is made of 2 special boxes:

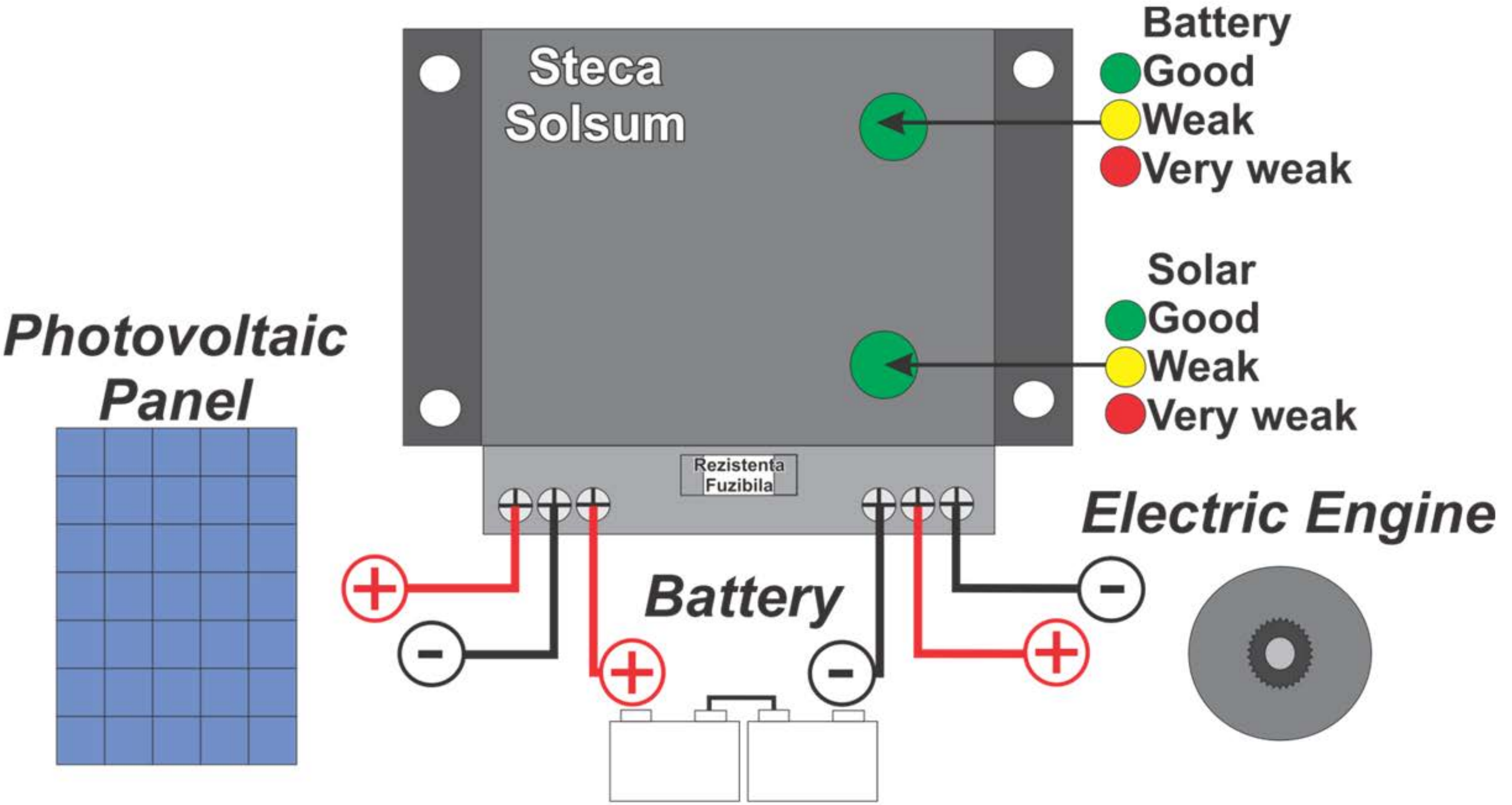
1) User interface
2) Electric box components

Between the boxes are wires to transfer the data.

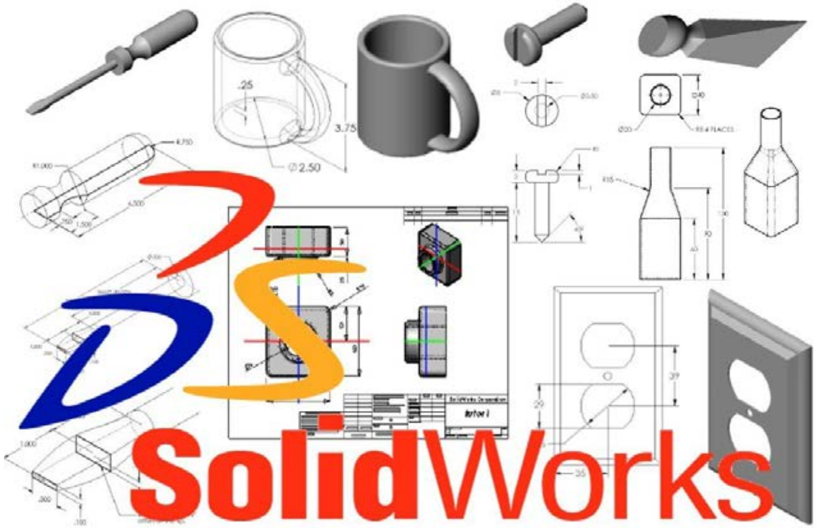


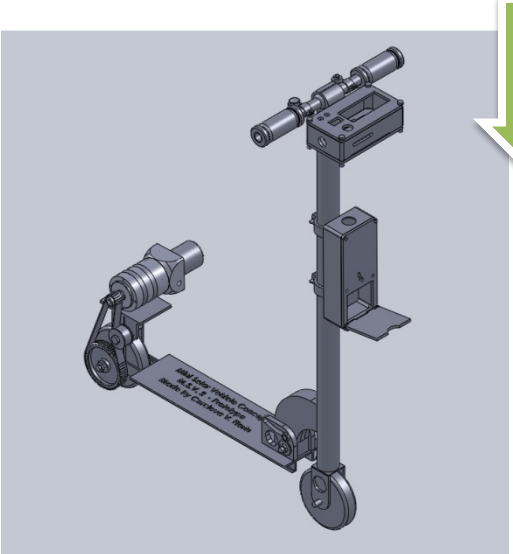


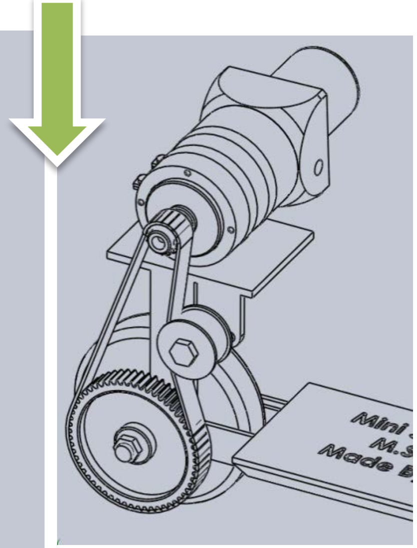
Charging module of the M.S.V.2



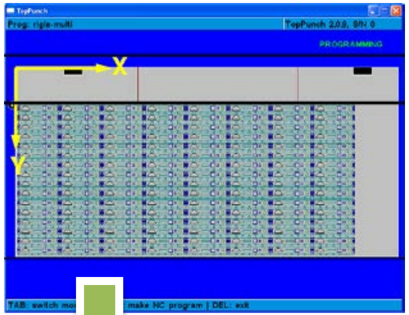
SolidWorks

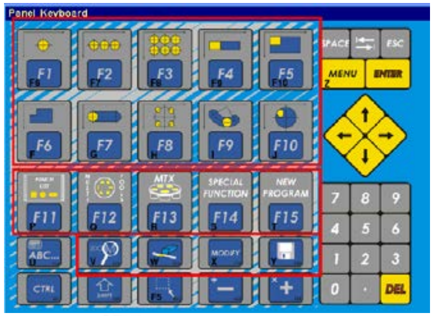


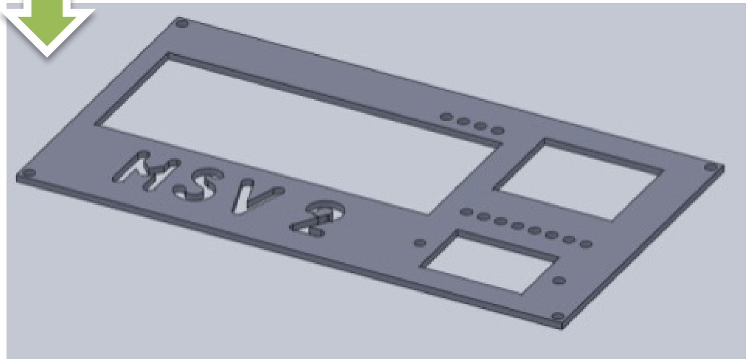




TopPunch

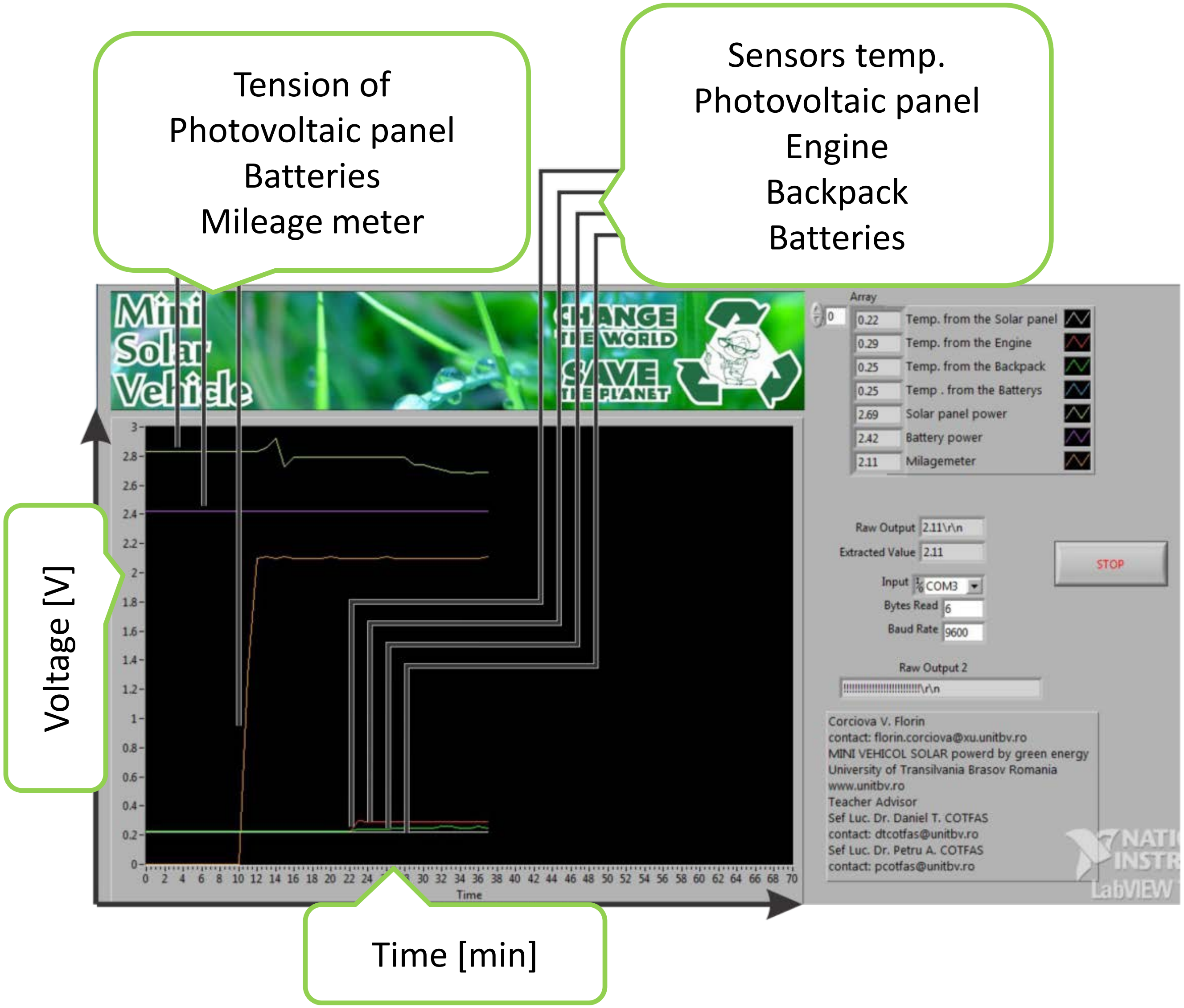






DEMO M.S.V.2

Data Transfer



Tension of
Photovoltaic panel
Batteries
Mileage meter

Sensors temp.
Photovoltaic panel
Engine
Backpack
Batteries

Voltage [V]

Time [min]

Array
0

0.22	Temp. from the Solar panel
0.29	Temp. from the Engine
0.25	Temp. from the Backpack
0.25	Temp . from the Batterys
2.69	Solar panel power
2.42	Battery power
2.11	Milagemeter

Raw Output 2.11\r\n
Extracted Value 2.11
Input COM3
Bytes Read 6
Baud Rate 9600

Raw Output 2
!!!!!!!!!!!!!!!!!!!!!!!!!!!\r\n

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MINI VEHICOL SOLAR powerd by green energy
University of Transilvania Brasov Romania
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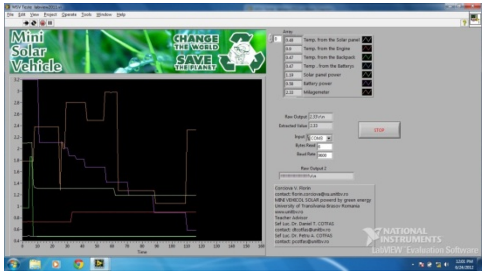
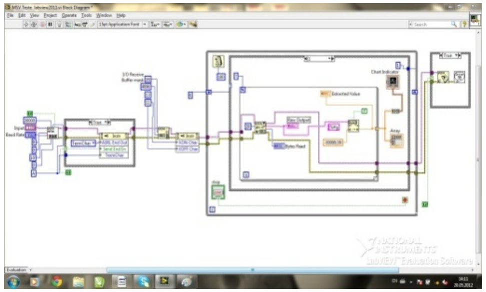
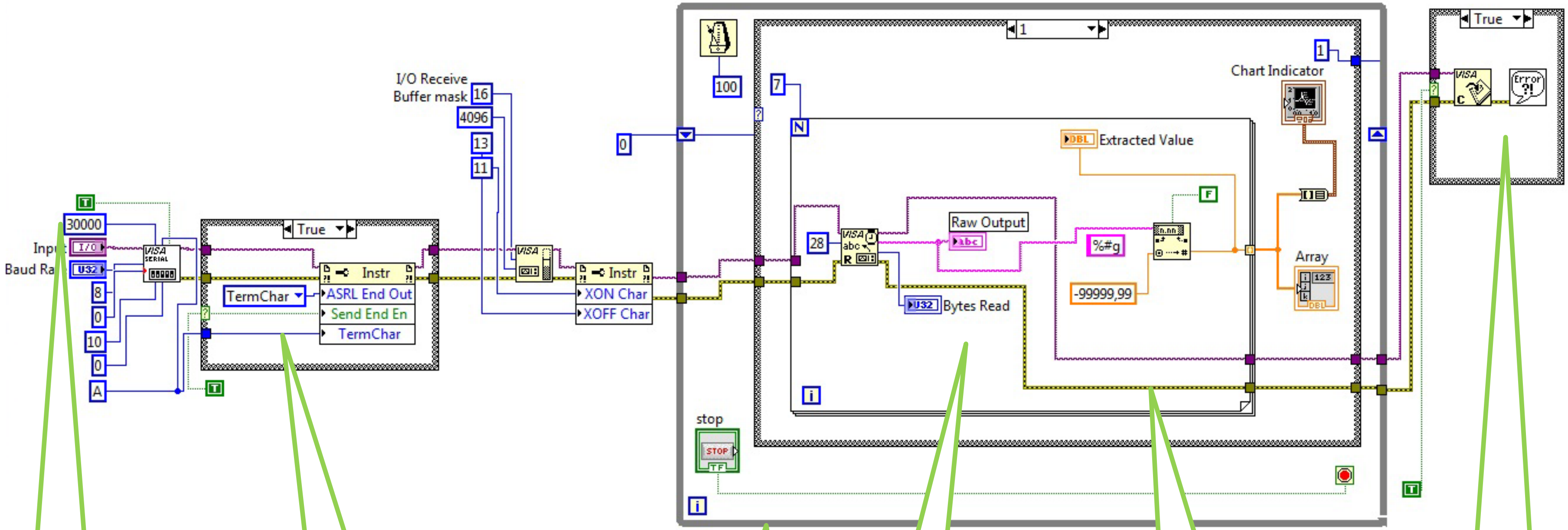
Sef Luc. Dr. Petru A. COTFAS
contact: pcotfas@unitbv.ro





LabVIEW can read all the sensors and display the gathered data on a graphic.

LabVIEW diagram



All the data from the MSV are imported from the Chip KIT MAX32 electric board.

The information is selected and after the message “!!!!!!!!!!!” it starts computing.

Continuous loop.

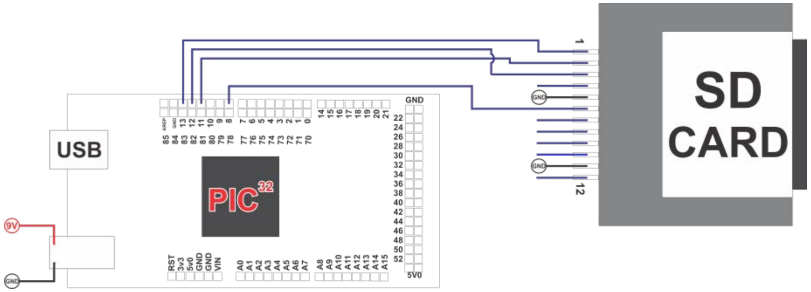
7 sheet loop (for this application 7 sensors are used).

All the voltages are transformed in data that can be read by the user from the PC on a graph.

Loop error.

Saving Data

First prototype of the SD Card DAQ



Data is saved on:

- SD card in .txt files;
- LabVIEW;
- Programming software.

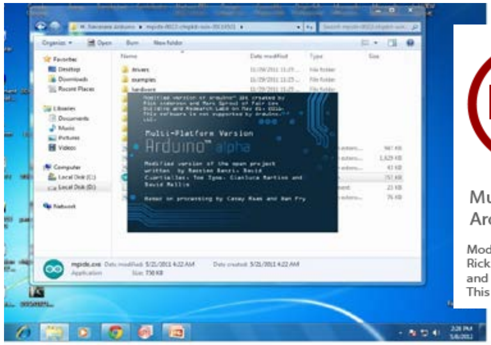
The data is extracted from .txt files to:

1. Windows XP/7:

- Microsoft Excel;
- Open office;

2. Linux Ubunt:

- Libre Office.



Modified version of Arduino™ IDE created by Rick Anderson and Mark Sproul of Fair Use Building and Research Labs on May 21, 2011. This software is not supported by Arduino™ LLC.

Multi-Platform Version

Arduino™ alpha

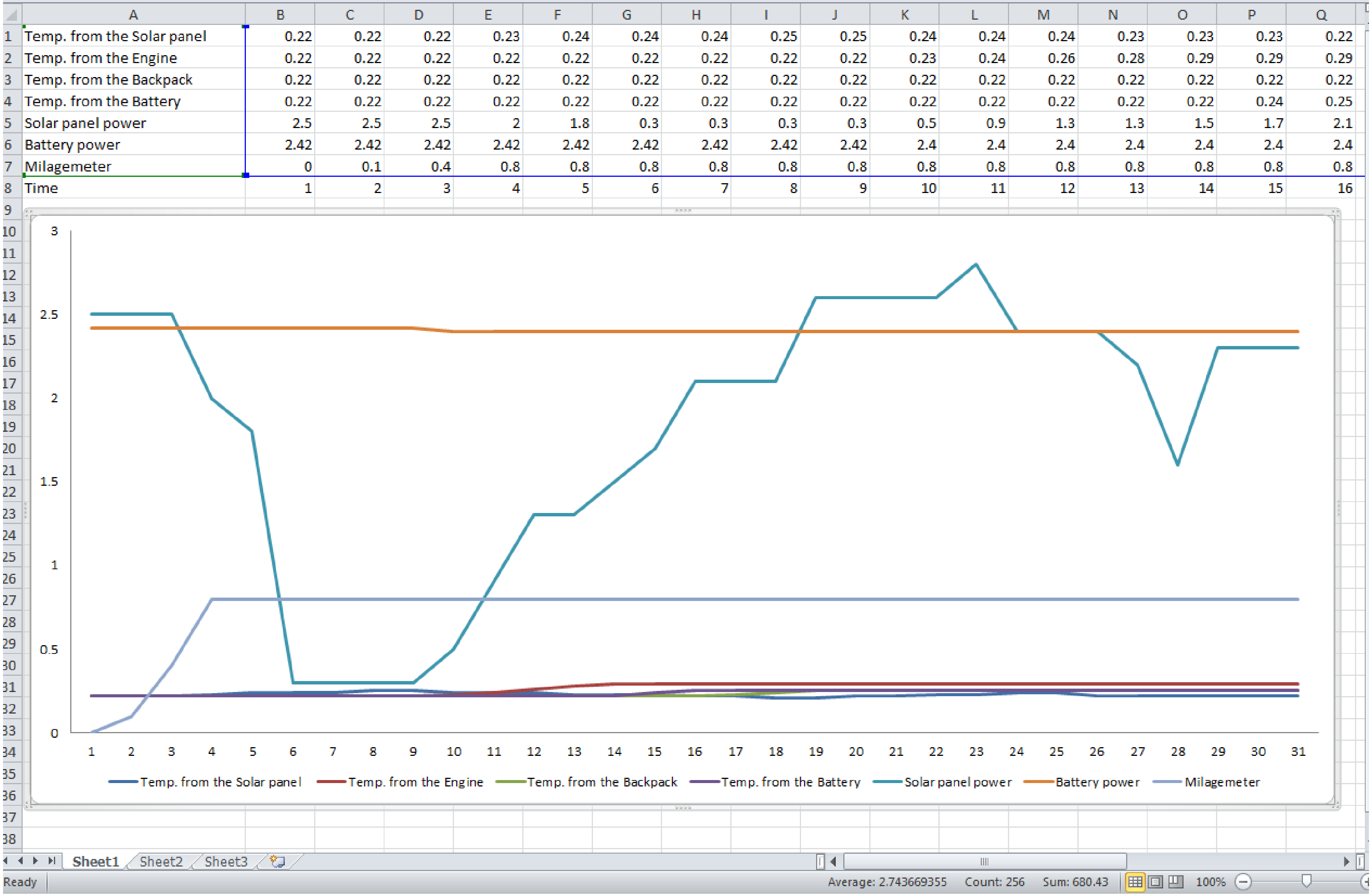
Modified version of the open project written by Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino and David Mellis

Based on processing by Casey Reas and Ben Fry

Multiplatform Arduino compatible IDE
Arduino 0023 Compatiblity

Modified version of the Arduino IDE created by
Rick Anderson and Mark Sproul of Fair Use Building
and Research on May 21, 2011.
This software is not supported by the Arduino LLC

Data conversion in Excel

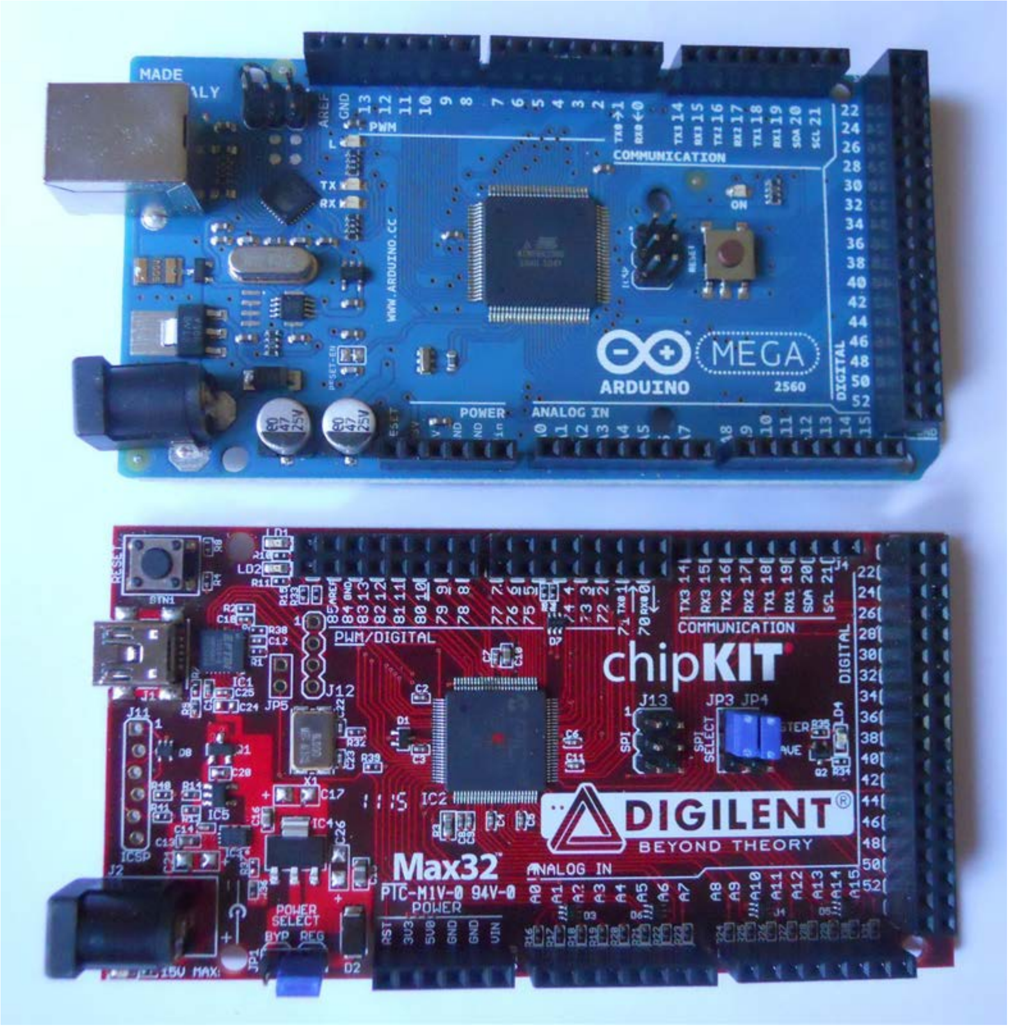


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Temp. from the Solar panel	0.22	0.22	0.22	0.23	0.24	0.24	0.24	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.23	0.22
2	Temp. from the Engine	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.24	0.26	0.28	0.29	0.29	0.29
3	Temp. from the Backpack	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
4	Temp. from the Battery	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.24	0.25
5	Solar panel power	2.5	2.5	2.5	2	1.8	0.3	0.3	0.3	0.3	0.5	0.9	1.3	1.3	1.5	1.7	2.1
6	Battery power	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.4	2.4	2.4	2.4	2.4	2.4	2.4
7	Milagemeter	0	0.1	0.4	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
8	Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Ready

Average: 2.743669355 Count: 256 Sum: 680.43

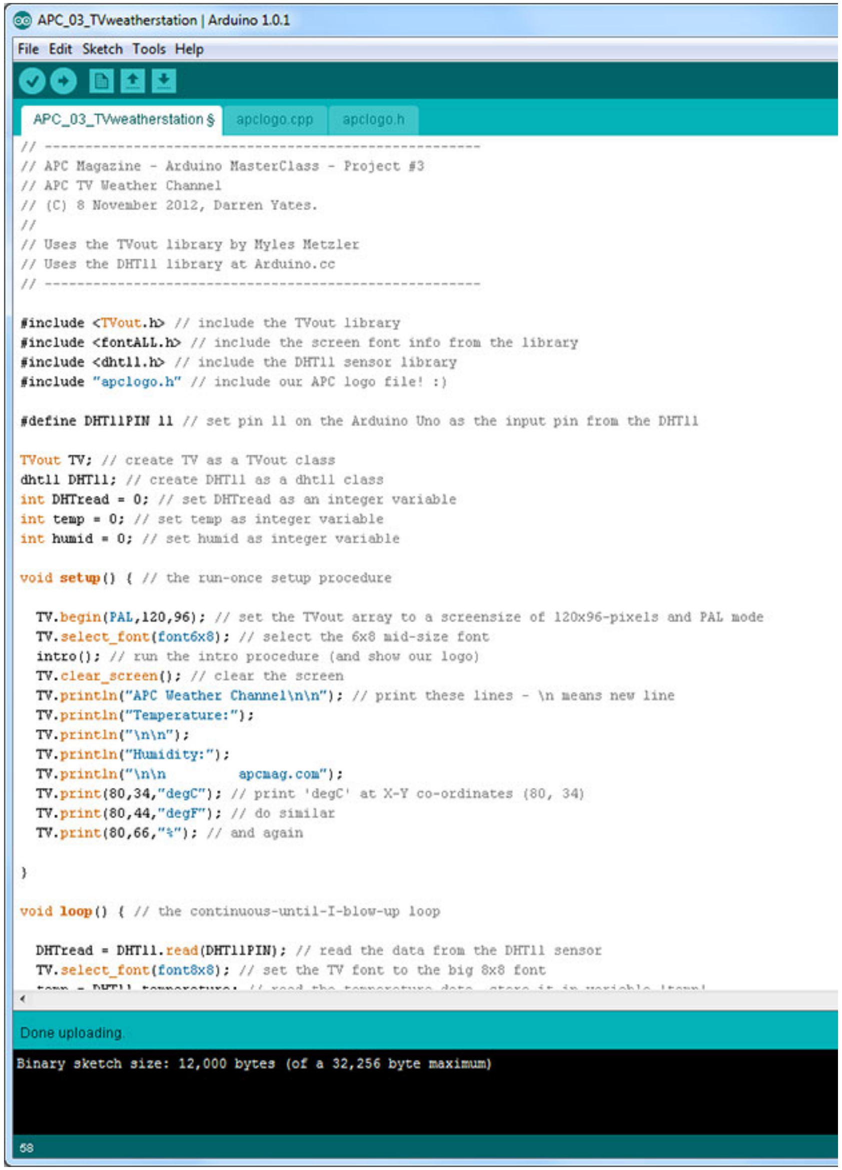
Hardware Arduino / Max32chipkit Differences



Microcontroller: Atmel ATmega1280

Microcontroller: Microchip®
PIC32MX795F512

Programming Software Arduino / Max32chipkit similarities



APC_03_TVweatherstation | Arduino 1.0.1
File Edit Sketch Tools Help
APC_03_TVweatherstation §
apclogo.cpp
apclogo.h
58

```
// ---------------------------------------------------------
// APC Magazine - Arduino MasterClass - Project #3
// APC TV Weather Channel
// (C) 8 November 2012, Darren Yates.
//
// Uses the TVout library by Myles Metzler
// Uses the DHT11 library at Arduino.cc
// ---------------------------------------------------------

#include <TVout.h> // include the TVout library
#include <fontALL.h> // include the screen font info from the library
#include <dht11.h> // include the DHT11 sensor library
#include "apclogo.h" // include our APC logo file! :)

#define DHT11PIN 11 // set pin 11 on the Arduino Uno as the input pin from the DHT11

TVout TV; // create TV as a TVout class
dht11 DHT11; // create DHT11 as a dht11 class
int DHTread = 0; // set DHTread as an integer variable
int temp = 0; // set temp as integer variable
int humid = 0; // set humid as integer variable

void setup() { // the run-once setup procedure

  TV.begin(PAL,120,96); // set the TVout array to a screensize of 120x96-pixels and PAL mode
  TV.select_font(font6x8); // select the 6x8 mid-size font
  intro(); // run the intro procedure (and show our logo)
  TV.clear_screen(); // clear the screen
  TV.println("APC Weather Channel\n\n"); // print these lines - \n means new line
  TV.println("Temperature:");
  TV.println("\n\n");
  TV.println("Humidity:");
  TV.println("\n\n          apcmag.com");
  TV.print(80,34,"degC"); // print 'degC' at X-Y co-ordinates (80, 34)
  TV.print(80,44,"degF"); // do similar
  TV.print(80,66,"%"); // and again

}

void loop() { // the continuous-until-I-blow-up loop

  DHTread = DHT11.read(DHT11PIN); // read the data from the DHT11 sensor
  TV.select_font(font8x8); // set the TV font to the big 8x8 font
```

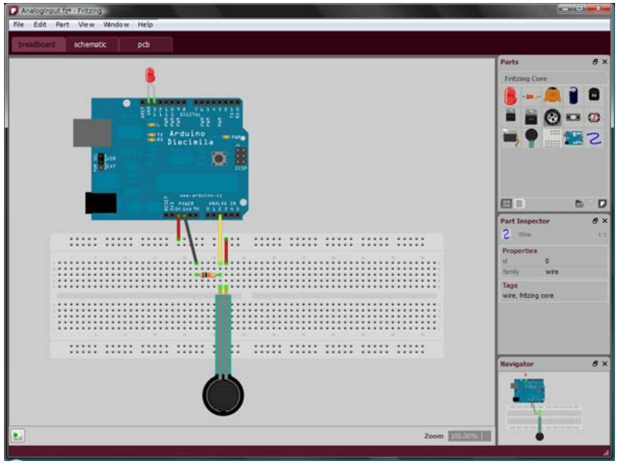
Done uploading.

```
Binary sketch size: 12,000 bytes (of a 32,256 byte maximum)
```

The open-source Arduino environment makes it easy to write code and upload it to the i/o board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing, avr-gcc, and other open source software.

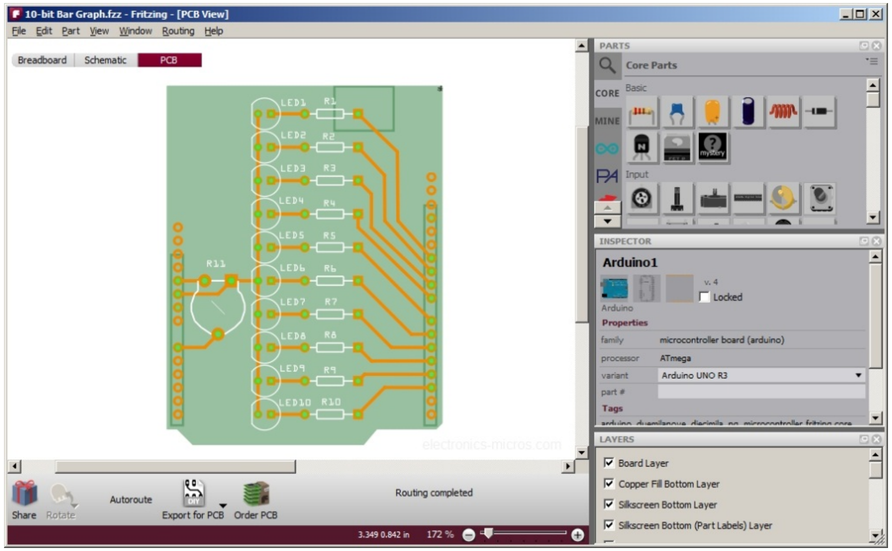
Fritzing PCB Design

Fritzing is an Electronic Design Automation software for designers, artists and for anyone who has interest in physical computing and prototyping.
Fritzing's goal is to provide easy tools for documenting and sharing physical computing projects, producing layouts for Printed Circuit Boards (PCB) and teaching electronics.
The software it`s free.



Properties
id 0
family wire
Tags
wire, fritzing core

Breadboard View



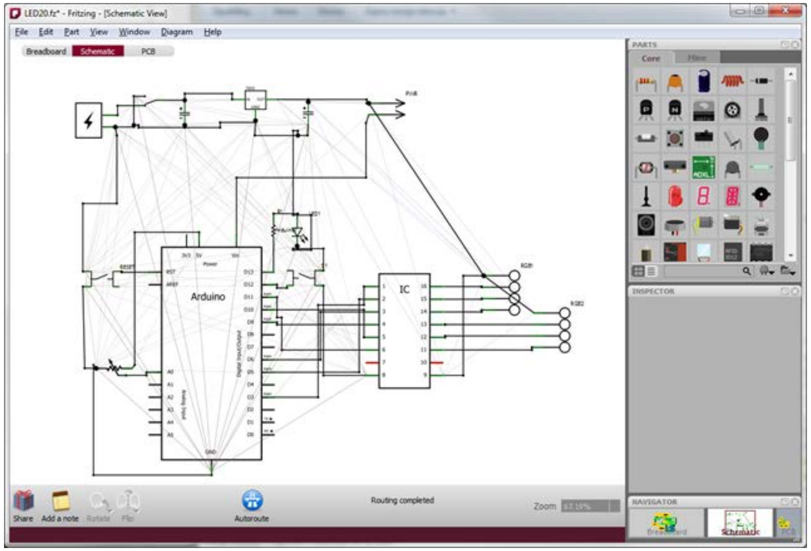
Arduino1
v. 4
□ Locked
Arduino
Properties
family microcontroller board (arduino)
processor ATmega
variant Arduino UNO R3
part #
Tags

☑ Board Layer
☑ Copper Fill Bottom Layer
☑ Silkscreen Bottom Layer
☑ Silkscreen Bottom (Part Labels) Layer

Routing completed

3.349 0.842 in 172 %

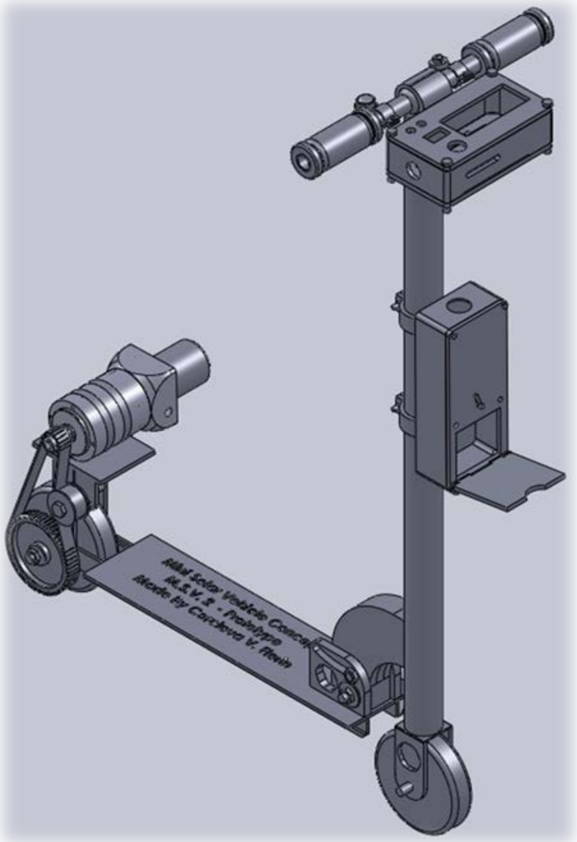
PCB View



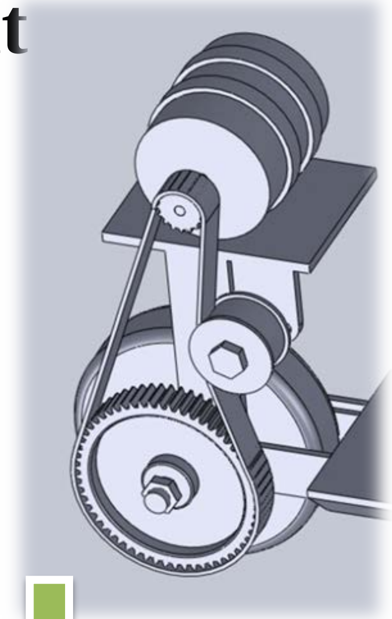
Routing completed

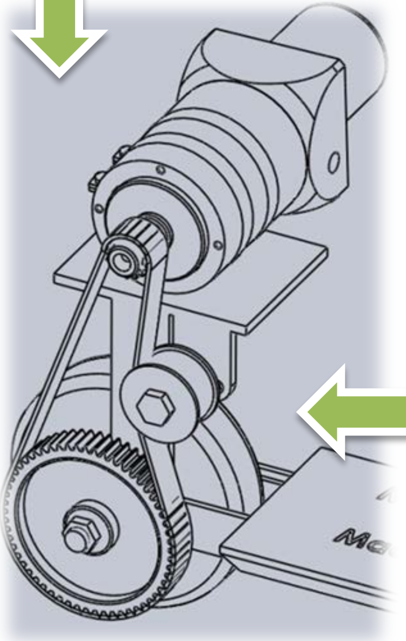
Schematic View

Future development



Autonomy: 2 h +
Maximum speed: 12 Km/h +
Weight:15 Kg
Maximum Permitted Load: 100Kg





Motor Electric
Brushless 2000W – 22V
Maximum current – 90 A
Maximum voltage – 30 V
Power max – 2665 W

Battery
Capacity: 5000mAh
6 Cells / 22.2V
New Technology-Nano-Tech:

ESC

Planetary reductor
20:1

Thanks!

For more information:
corciova.florin@gmail.com
florin.corciova@xu.unitbv.ro

Thanks for suport

Acknowledgement

Thanks to Dr. Cotfas T. Daniel, Dr. Cotfas A. Petru, Dr. Eng. Mircea V. Dragoi and Dr. Eng. Filip C. Alexandru for the scientific support during the development of the project.

Sponsors:

Transilvania University
Brasov – Romania

Club Vila Bran

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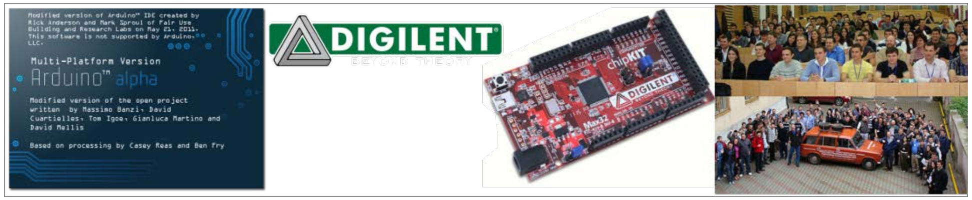
Modified version of Arduino™ IDE created by Rick Anderson and Mark Sproul of Fair Use Building and Research Labs on May 21, 2011. This software is not supported by Arduino, LLC.

Multi-Platform Version
Arduino™ alpha

Modified version of the open project written by Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino and David Mellis

Based on processing by Casey Reas and Ben Fry

Steca Romania

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