Emerald Coast Electrathon Report

2012-2013

Speed Racer

Pulse

Los Altos Academy of Engineering

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I. Acknowledgements

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II. Introduction and Development

Project Pulse was a project that the students of The Los Altos Academy of Engineering had been working on since the year of 2011-2012. At the close of the 2011-2012 school year, our engineering team and the senior class had achieved their goal in building a drivable version of Pulse. Our main objectives for Project Pulse for the year of 2012-2013 were for it to actually race in the Emerald Coast Electrathon in Florida and to obtain an average speed of 30 miles per hour. In order to get there, the electrical and composites component of the vehicle had to be completed, in addition to fundraising $10,000.00.

In the beginning of the year, composites already had their own design for the vehicle. We were going to build our own plug to do a lay-up off of that made the shell of the body. However, a month into the production of the plug, we had realized that our body violated one of the design rules of the body. Our vehicle was five feet in width while the rules stated that the maximum width was four feet. The composites team was then forced to make a brand new body design for Pulse with even less time.

In addition to Project Pulse, we had also decided to bring Speed Racer, an electric vehicle from the APS Solar and Electric 500, to the Electrathon race in celebration of its 20th anniversary. Working on Speed Racer allowed the electrical team more experience with making an electrical vehicle. Our team had also decided on adding telemetry along with the schematics on both Pulse and Speed Racer. The purpose of telemetry was to help us monitor battery levels or the vehicle in order to take some of the pressure and distractions off of the drivers. It also gave us data that we could work with in order for us to make a plan that would give the car the most efficient run. The original design of Pulse was based on the power calculation formula, which encompasses all the significant components that add to efficiency, which is one of the goals for our Electrathon race in Florida. Some important aspects include Coefficient of Rolling

Resistance, which is the friction between the wheel and the surface and Coefficient of Drag is the resistance forced upon the vehicle by air flow. We performed several roll down tests that helped us to determine the rolling resistance of each wheel so we could alter it so it could benefit our vehicle in the future.

$$P = [W * Crr + ½ * P * V2 * Cd * A] * V$$

P = ft/lb

W = Weight = 560 lbs

Crr = Coefficient of Rolling Resistance = 0.0055

p = Air Density = 0.00238

V = Velocity = 30 miles/hr = 44 ft/sec

Cd = Coefficient of Drag = 0.28

A = Frontal Area = 939 in^2 = 6.5 ft^2

P = 320.0 ft/lb = 434 watts

III. Design

Concepts:

When our team designed Pulse last year, there were two main objectives that we wanted to achieve with our electric vehicle. The first goal was to have the vehicle meet all the rules and specifications of the Electrathon USA race that it would be competing in. The second goal was for Pulse to travel 30 miles in one hour without stopping to charge its batteries. The process of building Pulse began with a chassis design of 3/4" steel tubing welded together to create the vehicle structure. The team had to make sure that the chassis design would ensure the driver's safety. We decided to use heavier, steel tubing, instead of aluminum because of steel’s structural integrity and flexibility to change and our inability to weld aluminum.

While we were building Pulse this year, we came across numerous flaws and errors in the design and had to constantly make changes to our plan. For example, a major aspect of Pulse that our team planned to fix was the driver’s upright position. The upright position caused the vehicle to have more frontal area, which decreased the efficiency of Pulse. With this in mind, our future design will have the driver in a reclined position to decrease the frontal area of the vehicle, which in effect would increase the aerodynamics of the vehicle.

Our team had decided to race Speed Racer, a vehicle built by LAAE in 1993, in this year's Electrathon race to celebrate its 20th anniversary. Speed Racer was built for the Electrathon race and was initially restored to give electrical team members experience. However, the team decided to race Speed Racer. The electrical team worked tirelessly to bring Speed Racer to the 21st century, adding brand new technology, like telemetry. Speed Racer was built 20 years ago, the design team did not have a record of drawings and designs made.

Pulse was designed with power calculation as the guideline. Power calculation is a formula that determines the amount of power, in foot pounds, needed to travel at a constant velocity. We then convert this into watts to use for our vehicle. This formula, shown below, helped us to understand the different factors that would affect our vehicle's efficiency.

$$P = (W * C_{rr} + \frac{1}{2} * C_d * A * p * V^2) * V$$

There are two different parts to this formula. There is the mechanical part, which is composed of the total weight in pounds, *W,* and the coefficient of rolling resistance, *Crr*, and the aerodynamic term, which consists of the coefficient of drag, *Cd*, and the frontal area, *A*, and the other variables. Power calculation helped us to understand that at higher velocities, the mechanical portion, such as the weight of our vehicle, was not as important as the aerodynamics of the vehicle. Using this formula would help us accomplish our goal of traveling 30 miles in one hour during the Electrathon race.

Considerations and Issues:

Since Pulse was mainly built last year, there have not been many changes to the design. Originally, through the instruction of Bob Franz, former instructor of the LAAE, the body of Pulse was supposed to cover all three of its wheels to prevent vortex, a buildup of wind within the wheels that increases drag, from occurring. However, the covering made the width of Pulse exceed the limit of 4 feet set forth by the Electrathon rulebook. The design was then changed to not cover the two front wheels. This year we also added more triangles in the chassis for better support due to the fact that triangles are the sturdiest shape. Additional triangles would not only increase the strength of the chassis, but also ensure the safety of the driver if a collision was to occur.

A major aspect of Pulse that we revised was the cross member. The previous cross member of Pulse consisted of three separate metal tubes welded together. Since the welds were the weakest part of the chassis, the team was concerned that the vehicle would collapse just from the stress created by driving. Therefore, we bent a long tube to create just one solid cross member to strengthen the chassis and to increase the safety of the driver. For Inertia, instead of a cross member we used a double wishbone chassis to balance out the weight distribution of the vehicle. This allows for the center of gravity to be even on both sides of the vehicle for better efficiency. Though the design team currently has a drawing for the double wishbone chassis of Inertia, it has not been welded on to the vehicle yet. We plan to complete this task during the 2013-2014 school year in order to compete in the next Electrathon.

IV. Electrical

Pulse:

Project Pulse was built to fit the specifications set down by Electrathon America. This set the parameters for many aspects of how we would design our vehicle. Our batteries would have to be sealed lead acid. Although the voltage of the batteries was not limited, the weight is limited to a total of seventy-three pounds. We were also not allowed to use any sort of specialized or custom batteries, such as lithium ion batteries. In Project Pulse, the rules required us to place a circuit breaker or a fuse between the battery and any electrical device, as required by the rules, and must all be placed as close as practically possible to the source of power. All of our fuses have been sized in accordance to the rules to protect the wires of the system that they are connected to. As a safety precaution, the driver must be able to shut off the electrical system. In addition, the motor controller must be able to shut off when the driver releases the accelerator.

The electrical design of Pulse changed from last year to this year. For instance, it was changed from a twenty-four volt to a thirty-six volt system. This was because we could get more voltage but stay within the battery weight limit. We also changed the motor controller due to a malfunction of our previous Scott motor. The problem was that its armature was scraping against the brushes to a point where it negatively affected the performance of the motor. To resolve this we replaced it with a new Mars motor. We have also added telemetry to the system so that the vehicles could be under constant monitoring by a pit crew member in addition to the driver. In the future we would like to fully utilize the telemetry systems as well as the cycle analyst. We plan to use it as a cruise control by setting the amperage at a fixed amount to better improve the overall efficiency of Project Pulse.

Throughout the process of constructing Project Pulse we faced many issues with the vehicle. The goal was to optimize its aerodynamics but due to the vehicle being fairly small, it was a challenge to place any electrical components specifically, the batteries. This provided little playroom to work with electrical components needed to power the vehicle.

Another challenge was determining what was wrong with the Alltrax motor controller. It first blinked red seven times which meant that the batteries we had placed were providing more voltage than what the motor controller was programmed for. Once we modified the motor controller to work with higher voltage settings, the system functioned properly. One of the other challenges was mounting both a fuse and a switch onto the body of Pulse. Since metal is conductive, placing the two terminals of the fuse on the frame of the vehicle would have caused a spark, thus blowing the fuse. The solution was to mount PVC under it, because PVC is not conductive. The most persistent issue we had on Project Pulse was the potentiometer malfunction. Our foot pedal potentiometer was set to low and that would not allow the motor to receive enough energy to spin while attached to the chain.

We decided to use the ER-35 Odyssey batteries. We used these batteries in a thirty-six volt pack, which means that we are using three batteries hooked up in series with each other at twelve volts each. The batteries are twenty-three and a half pounds each, making the pack seventy and a half pounds. This battery pack system works perfectly for the vehicle as far as meeting the weight requirement. With this battery setup the vehicle can run for an hour straight at a constant discharge rate of twenty-one amps without the voltage of the batteries dropping below the set minimum voltage, which is eleven volts per battery.

The original decision of what motor was to be used for Project Pulse was the Scott motor. However, as stated earlier in the report, this motor had a malfunction with its armature scraping against the brushes. This called for a replacement motor which, in this case, was the Mars motor. This motor was slightly larger than the Scott but it offered more revolutions per minute for the wheel. The positioning of terminals was another difference between the two but that wasn't a problem.

The motor controller we decided to sue for Pulse was the AXE4844 Alltrax motor controller. This controller is reliable and it is what we use in most, if not all, of our electric vehicles because of its ease of functionality and size. This specific variant of the Alltrax motor controller we use is shorter in length, which allowed us to maneuver it around and fit it in the vehicle with ease. The motor controller is easily one of the most important components of the vehicle because without it, the vehicle cannot function. The Alltrax motor controller was our choice of motor controller because of its capability to be programmed as we saw fit and function based off of what is needed.

The fuses of the system were placed in different places of the vehicle for different reasons. Aside from the ones in between the batteries, as stated above, there is another fuse that is placed in between the "B+" terminal on the motor controller and one of the high current switches that will lead to the motor. The system uses three different switches, two high current hand isolator switches, and a low current switch. The two high current switches are there to prevent the free flow of electricity through the system and act as a safety precaution for the driver and other electrical components in the system. They are located on the sides of the vehicle. The low current switch regulates when the motor controller is turned off and on and is located on the dashboard. Pulse uses a throttle system which we are simply calling a double potentiometer system. This means that we have a variable resistor at the foot pedal acting as the main throttle for the system which, in turn, controls the speed of the motor. The second variable resistor, which is located on the dashboard, controls the amount of resistance the main throttle can put into the system. This makes it easy on the driver because he/she would only have to hold his/her foot on the pedal while regulating resistance on the dashboard.

<u>Speed Racer:</u>

Speed Racer is a twenty year old vehicle and the first of the electrical kit vehicles made for racing in the electric vehicle competitions. Its original design of schematics and positioning of components alike has been kept throughout the years. As for the components of the vehicle, Speed Racer uses a twenty-four volt system with two batteries. The batteries that were used for Speed Racer were two PowerSonics, which are twelve volts each and weigh twenty-six and a half pounds each. This matches the seventy-three pound weight limit for batteries perfectly. The batteries themselves are extremely efficient to the point where they can take a load of thirty amps for a whole hour. This makes it so we can stay on the track as long as necessary with little to no worry of our batteries running out of energy.

The electrical system is controlled by three switches. Two of these switches are meant to handle high current coming from the batteries and going to the motor. One of these switches is positioned so that the driver may control the current of the circuit, either turning the vehicle on our off, with ease. The other is positioned on the exterior of the vehicle for officials and race pit team members to do the same. The switches are positioned as such so that the vehicle may meet the requirements stated in the Electrathon America rule book and so that the driver is as safe as possible. The third switch is located on the dashboard of the vehicle for easy access to the driver. The function of this switch is to enable current to flow to the motor controller which will turn it on. As compared to the other two switches, this switch is designed to handle a lower amount of current and is much smaller.

The motor controller that we used in Speed Racer is an AllTrax, model number AXE4844. This motor controller is optimal for our system because it is easy for pit crew members to arrange wires according to what they lead to and what function they serve. It is also simple for our team to program it with a computer and to set the motor controller to meet our needs as far as how much voltage it can handle, as well as the amount of resistance in the current it can handle without error. The size of the motor controller also meets our standards because it is able to fit in the vehicle without interfering with the movement of the driver.

One major component that ensures the safety of the driver, race officials, and team members alike are the fuses. These keep a limit on the current going the circuit based off of their rating. For example, we are using one-hundred amp fuses in our system to match the rating of our wires and the voltage of our batteries. This means that no more than one-hundred amperes of current may flow through the fuse. If any amount of current greater than one-hundred amperes were to pass through the fuse the fuse would break, thus halting any flow of current through the system. This protects all the other components of the system and lowers the chances of members grounding to the current flow and getting shocked. The fuses are placed between the batteries, in between any electrical component and the batteries, and between our high current switches and components such as our motor. This setup of fuses is required by the rules of Electrathon America and to ensure the safety of our electrical components and team members.

The motor used in Speed Racer was a Scott motor, which has been the motor for Speed Racer for the last twenty years. The reasoning behind the decision to keep the motor the same was because of its ability to move the vehicle efficiently without using a lot of voltage from the batteries. Being that the Scott motor offers a fairly decent amount of revolutions per minute to move the vehicle, it was a good decision to keep it. It is also sized well enough to fit into the vehicle with ease and its size also gives us the advantage to move things around near the motor and give us more room to work.

The major electrical technical difficulty with Speed Racer was an error in the motor controller because there was resistance going through the circuit because of the variable resistor being misdialed. The misdialing was caused by human error because the operator did not make sure the variable resistors were in the right settings. The consequence of this was being put out of the majority of the race and not being able to count as many laps as we could have. This issue could be resolved by improving our ability in checking wires and dialing the potentiometers correctly.

Telemetry:

For the telemetry system that we established for the vehicles, we had two options. We could have purchased logging applications such as LoggerPro, or we could have created our own application. The reasons that we decided to create our own application was that we can manipulate the data if needed. A logger application would not be as configurable as an application developed from scratch.

Before an application can be developed, one needs to understand the data being sent. For both projects we had a Cycle Analyst embedded within each vehicle. The Cycle Analyst is a fantastic microprocessor in the sense that it not only reads the data, it also displays it for our driver. The device also has the capabilities to output the data it is displaying through an RS-232 port which is what connects the transceiver and the computer displaying the data.

The goals for our application were the following:

-Receive data (For the Cycle Analyst, we received data through the RS-232 port)

-Separate date (For the Cycle Analyst, we received Amp-Hours, Voltage, Amperage, Speed, and Distance)

-Display the separated data on the application

-Save all data in a file (Text file, excel spreadsheet, etc.)

-Be user friendly so that a user can understand how the application works by simply looking at the application

There are various languages that one can use to make the application. The language that we used to create our application was Visual Basic (VB.net) because of the simplicity of making Windows applications. By using Visual Basic, one is simply left with the task of manipulating the data and displaying it.

During the race, however, the system did not function correctly and taken off of the vehicle. The reasoning behind this was that it was interfering with the performance of the vehicle to the point where it would not function at all

```vb
Imports System.IO.Ports 'Standard headers you will use
Imports System.ComponentModel   'Standard headers you will use
Imports System.Threading    'Standard headers you will use


Public Class Telemetry


   Public connection As New System.Threading.Thread(AddressOf
ConnectionUpdater)   'Connection thread, uses multithreading in order to
detect loss of connection
   Public txt As String    'Records all data recieved to output it in a
text file for later review
   Public Incoming As String   'Used to carry incoming string and saved to
txt and sep string for manipulation
   Public sep As String    'Used to seperate the data and to display
incoming data
   Public iTick As Integer = 0 'Used in Connection Updater, after a
certain time of not recieving anything the application will display that
connection has failed
   Public sTick As Integer = 0 'Used in Connection Updater, but it is used
to clear the display stringg "sep"


   Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load


       System.IO.Directory.CreateDirectory("DATA") 'On startup, creates a
folder named "DATA"
       Dim myPortNames() As String 'Used to get the available serial port
names
       myPortNames = IO.Ports.SerialPort.GetPortNames()
       portList.Items.AddRange(myPortNames)    'Lists out available ports
for user selection
       closeButton.Enabled = False 'Close button is not enabled since the
connection has not yet been established
       connection.Start()  'Starts the connection thread
   End Sub
   Private Sub NoConnection()  'If there is no connection, the windows
will display "N/A"


       ampHours.Text = "N/A"


       Volts.Text = "N/A"
```

```
        Amps.Text = "N/A"


        Speed.Text = "N/A"


        Dist.Text = "N/A"


    End Sub


    Private Sub ConnectionUpdater() 'Part of the connection thread
        Do
            If iTick > 10 Then


                Me.Invoke(New MethodInvoker(AddressOf NoConnection))
                iTick = 0


            End If


            If sTick > 5 Then


                sep = ""


            End If


        Loop
    End Sub


    Private Sub initButton_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles initButton.Click   'Describes function of the
"Init" button


        Try 'In a try statement in case there are errors
            With SerialPort1


                .PortName = portList.Text   'Makes SerialPort1 the selected
port
```

```
                .BaudRate = baudList.Text   'Makes the selected baud rate
SerialPort1's baud rate
                .DataBits = 8   'the rest is standard
                .Parity = Parity.None
                .StopBits = StopBits.One
                .Handshake = Handshake.None

            End With

            SerialPort1.Open()  'Will open SerialPort1
            Timer1.Enabled = True   'Enables the connection and display
timers
            Timer2.Enabled = True
            baudList.Enabled = False    'Configures lists, disables the
baud rate list
            portList.Enabled = False    'Configures lists, disables the
ports list
            initButton.Enabled = False  'Configures buttons, disables the
Init button
            closeButton.Enabled = True  'Configures buttons, enables the
Close button

        Catch ex As Exception   'If there is an error

            Try

                SerialPort1.BaudRate = baudList.Text    'Checks to see if
baud rate was selected

            Catch

                MsgBox("No baud rate selected")

            End Try

            Try
```

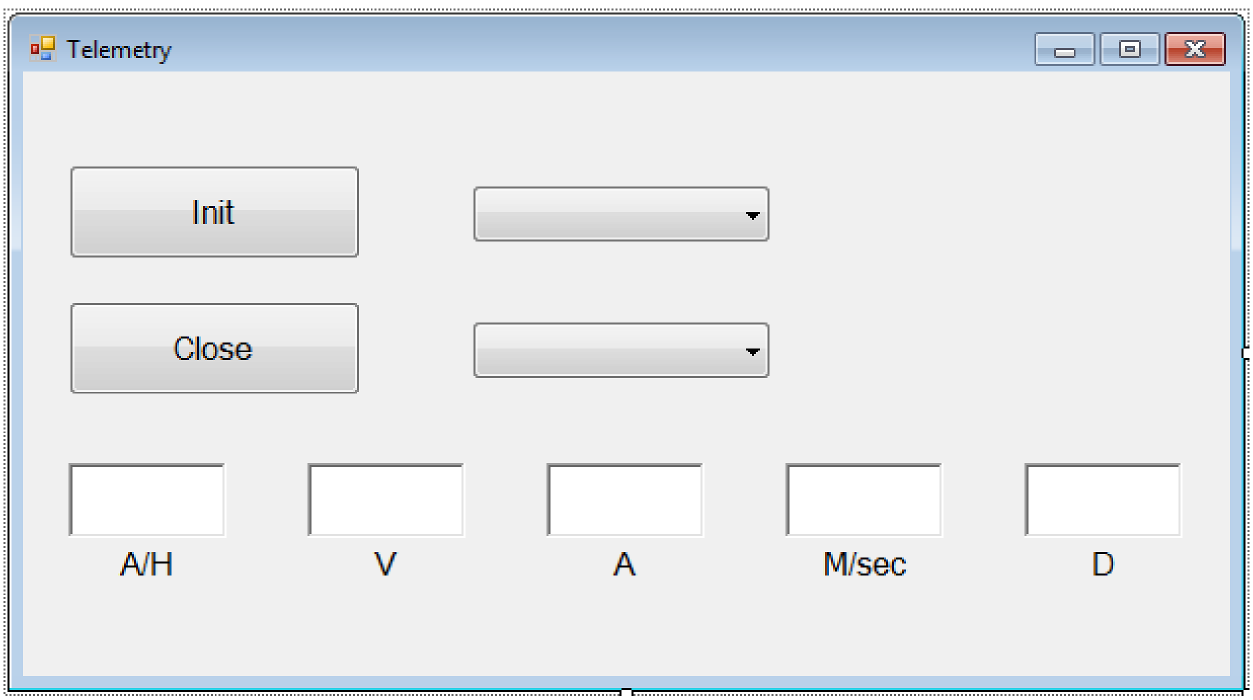
```
                SerialPort1.PortName = portList.Text    'Checks to see if
port was selected

            Catch

                MsgBox("No port selected")

            End Try


        End Try

    End Sub

    Private Sub Seperator() 'Display seperation function, use of Arrays

        Dim s As Integer    'Used to seperate string
        Dim ary() As String 'Used to seperate string
        Dim str As String = sep 'str is a string that is manipulated to
seperate the string
        Try
            ary = str.Split(Chr(9)) 'Splits str at every tab (Chr(9))
            For s = 0 To UBound(ary)    'Gives a number to every split

                ampHours.Text = ary(0)  'Displays the seperated
                Volts.Text = ary(1)
                Amps.Text = ary(2)
                Speed.Text = ary(3)
                Dist.Text = ary(4)


            Next s
        Catch
        End Try
    End Sub

    Private Sub DisplayText()
```

```
        txt &= Incoming 'Assigns text to txt string
        sep &= Incoming 'Assigns text to sep string
        Seperator() 'Calls seperator function


    End Sub


    Public Sub SerialPort1_DataReceived(ByVal sender As Object, ByVal e As
System.IO.Ports.SerialDataReceivedEventArgs) Handles
SerialPort1.DataReceived    'When data is recieved


        SerialPort1.Write("Message Received")   'Sends a string to the
Cycle analyst to show the driver that connection is established
        iTick = 0   'Resets iTick
        sTick = 0   'Resets sTick
        Incoming = SerialPort1.ReadExisting()   'Assigns Incoming string
the information being sent
        Me.Invoke(New MethodInvoker(AddressOf DisplayText)) 'Creates and
invokes a method (Displaytext)


    End Sub



    Private Sub closeButton_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles closeButton.Click 'When Close button is clicked


        SerialPort1.Close() 'Closes serial port
        portList.Enabled = True 'Configures lists, enables the ports list
        baudList.Enabled = True 'Configures lists, enables the baud rate
list
        initButton.Enabled = True   'Configures buttons, enables the Init
button
        closeButton.Enabled = False 'Configures buttons, disables the Close
button
        ampHours.Clear()    'Clears out windows
        Volts.Clear()
        Amps.Clear()
        Speed.Clear()
        Dist.Clear()
        Timer1.Enabled = False  'Disables timers
        Timer2.Enabled = False  'Disables timers
        iTick = 0   'Resets iTick
        sTick = 0   'Resets sTick
        Try
```

```
            Dim fs As New IO.FileStream("DATA/data.txt",
IO.FileMode.Create, IO.FileAccess.Write)   'Creates a new text file
            Dim S As New IO.StreamWriter(fs)    'Used to open text file
            Dim i As Integer    'Used to seperate txt string
            Dim j As Integer    'Used to seperate txt string
            j = 1
            Dim aryTextFile() As String 'Used to seperate txt string
            Dim inputString As String = txt 'Used to seperate txt string
            aryTextFile = inputString.Split(vbCr)   'Used to seperate txt
string at every carriage-return character
            S.BaseStream.Seek(0, IO.SeekOrigin.End) 'Opens text file
            S.WriteLine("Ah" & Chr(9) & "V" & Chr(9) & "A" & Chr(9) & "S" &
Chr(9) & "D")   'First in the text file, tells user what the data is
            For i = 0 To UBound(aryTextFile)    'Used to seperate txt
string
                If i = 0 Then   'First information is erased, since it
might contain errors
                ElseIf (i = 10 * j) Then    'Used to record txt string
after every 10 seperations
                    S.WriteLine(aryTextFile(i) & vbCr)  'Records seperation
and inserts a carriage-return character
                    j = j + 1
                Else
                End If
            Next i
            S.Close()   'Closes the file
            txt = ""    'Clears txt string
        Catch
        End Try
    End Sub


    Private Sub Timer1_Tick(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Timer1.Tick 'Connection Timer


        iTick = iTick + 1


    End Sub


    Private Sub Form1_FormClosed(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.FormClosedEventArgs) Handles MyBase.FormClosed  'If
the application is closed


        SerialPort1.Close() 'Closes serial port
        Timer1.Enabled = False  'Disable timer
```

```
        Timer2.Enabled = False  'Disable timer
        connection.Abort()  'Stop the connection thead


    End Sub


    Private Sub Timer2_Tick(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Timer2.Tick 'Display buffer Timer
        sTick = sTick + 1
    End Sub
End Class
```

Here is how the application was designed:



V. Mechanical

Pulse:

Subsystems of Pulse:

Pulse was constructed last year but this year, we made corrections with the chassis they built. The correction we made was a change to one solid piece of tubing for the cross member. They also made an extra support on the cross member, although the cross member was not our only situation that we faced. We had find a place for our battery and create battery box. We also included a front bumper to make sure our driver is safe in case of any collisions.

Most of the frame was created last year. The mechanical team created the vehicle out of ¾ hollow steel tubing. The Mechanical team decided to use the ¾ hollow tubing because we thought it would be the best to fishmouth and weld it all together. Some parts of the chassis were bent into place using the tube bender, while others were fish-mouthed. Fish-mouthing is a process that cuts a piece out of the end of a pipe so that it fits onto another pipe. Utilizing such a process made welding the vehicle much simpler and avoided leaving large gaps. A Joint Jigger allowed for easier fish-mouthing using a drill instead of a mill, the Joint Jigger made it so we did not have to waste much of our steel tubing from not accurate cuts on the mills. However with the Joint Jigger, the mechanical team had to retrieve a new formula using the help of Mrs. Gilbert, an AP Calculus teacher at Los Altos High School, in order to find the starting point of the cut. To make up for the safety issue addressed by the previous mechanical team, we made four PVC rods slightly smaller than ¾ that could fit on the front and act as bumpers. We made this bumper to make sure our driver was safe from any accident that might happen.

This vehicle sported a rack and pinion steering system so we were able to adjust our steering if need fairly easy. A steering wheel was attached to a steering shaft. The shaft was then connected to a pinion gear which was finally connected to the rack. When the steering wheel was spun, the steering shaft turned the pinion gear which pushed the rack either right or left. This simple mechanism allowed rotational movement into linear movement. Moving the rack also moved the tie rod, the steering arm, and eventually the wheels. We needed to get our wheels to turn a circle with a diameter of less than 50 feet curb according to the Electrathon rule book.

We decided to use drum brakes on the brake system of Pulse. We chose to use drum brakes instead of disc brakes because they do not scrub. Drum brakes are located on the inside of the wheel. Pressing on the pedal pulls on a cable which was connected to the brakes. The reason we did not use hydraulic brakes is because sometimes they lock up and would not work. The brakes then expand, applying friction to the wheel until it eventually slow down. We only applied drum brakes to the front two wheels. Because the drum brake did not touch the wheel, there was no friction. This decreased resistance allowing for a better efficiency. With Power Calc equation we tried to find the most efficient way to build and vehicle so the lowest amount of resistance that the drum brakes allowed us to decrease our rolling resistances.

The drive train was simple and similar to that of a bike. The motor on the vehicle turned a pinion which was connected to a simple bicycle chain. The chain also rotated. Finally, the chain was connected to a sprocket which was connected to the wheel. Spinning the chain also rotated the sprocket which rotated the wheels. We were working on fixing our gear ration so we could pull as much energy out of our motor so our car could be better efficient but our time prohibited us from doing that.

Our old swing arm was taken off and replaced with a new one. Last year, our swing arm did not follow the design made by the design team. Consequently, it did not follow the Ackerman angle. What the Ackerman angle is a value which gives the inner wheel to steer a greater amount than the outer one. Our new swing arm was built according to the design and now lines up in the Ackerman angle. Another issue we dealt with was the fact that we were unable to get the shocks to work. Instead of trying to fix it, we fish- mouthed a pipe and welded it from the chassis to the swing arm. Once we attached the new swing arm to the chassis, we also welded on pieces that made the vehicle sturdier. We decided not use suspension because we knew that the oval bank we were going to race on was not a dirt course. So from that we decided it would best not to add suspension because not needed for this course.

We changed the cross member based off of a tip from Mr. Franz and Mr. Keirns. Our surplus of welds on our vehicles compromised the structural integrity of our chassis. Our solution was to tube bend a 1” piece of tubing into a cross member. We then altered the existing kingpin plate to have a circular indent in place of the weld that was there originally. However, after we welded it onto the new crossmember we discovered that the lower bolt would collide with the cross member. Again, we had to adjust the kingpin plate by raising the indent to a height where the bolts would no longer collide with anything.

With the new crossmember, we had to alter the rack and pinion mount too. The new rack and pinion mount had an arc in it that was better suited for tubing.

Triangular supports were added to the rear of Project Pulse to reinforce the chassis. We added the triangular supports because of a suggestion from Mr. Franz. Previously, our chassis was too weak, the triangle supports helped to strengthen our chassis and to keep the driver inside the vehicle in case of any accident.

Steering rods were adjusted by making the rods longer so it could reach the spindle so we could fit our one solid piece crossmember that we changed this year.

A steering wheel base was added to the car, thus allowing driving to be easier for the driver since driver now had something to rest on instead of having to hold up the steering wheel. It also made it easier for the driver to get out of vehicle in case of an emergency because the wheel mount was easily removable.

We decided to use PVC to mount the front bumper, we lathed four pieces of PVC to 3/4” each and shaved off some of the end to the inner diameter of 3/4” tubing. Then we fastened it to the front of our chassis by drilling a hole through the chassis and PVC. The PVC acted as a “crumple zone”, allowing some of the shock to be absorbed by the PVC, so a collision would not affect the driver as much. Because the PVC would stop the impact or at least slow it down so it would not affect or put or driver in danger.

The design for the brake pedal was altered from the old design because we felt that our new design would fit better in this vehicle. We also discovered that the old brake pedal did not work properly so we changed it as well because it was too big so it would go down enough for the brakes to actually work.

The battery boxes were extremely reinforced this year, after learning from our mistakes on the battery boxes from previous years, Like some our mistakes we're not making the battery boxes as secure as possible or even to the point of not planning where the battery boxes were supposed to go. So we changed the design entirely. Before, the battery boxes were three pieces of iron welded together at a certain angle so that the battery would sit comfortably inside the three pieces of angled iron. Now however there would be four pieces of angled iron that would not be touching each other, instead, they were now welded to the chassis like a box, one for each corner of the battery. In addition, a strip of metal was welded from the angled iron on the top to the angled iron below them (see design for more detail). This reinforced the structure significantly by using the angle iron on top to support the weight the battery placed on the pieces of angle iron on the bottom.

Despite being able to fix the problem with the battery box design, we still faced an issue in regards to keeping the batteries in place during the race. We first proposed using rope to tie the batteries into place, but it would essentially not provide enough stability. Instead, we welded another piece of angled iron onto the strip of metal, and put a “threaded cylindrical object” on both strips of metal, so that we could fasten in the battery. We also added a battery box in the front, reinforced by a piece of tubing below the battery box.

We also changed from using Sava, MC2 tires for Pulse for newer wheels which were Tire, 20"x1.95", Maxxis Hookworm because the ones we were using last year had a very high rolling resistance, which is a bad thing. So we need to improve our vehicles efficiency.

Speed Racer:

Speed Racer was a car built by the alumni of the Los Altos Academy of Engineering. Speed Racer was a kit car which was built for an Electrathon race in 1993 for the APS Solar and Electric 500. Due to the car racing in an Electrathon where efficiency was vital to winning, Speed Racer was built around the Power Calc formula. On each interjoint of the chassis where each piece of the tubing meet, we cut a fish mount onto the pipe, allowing for a flush overlay with each pipe, allowing our welds to be stronger and therefore more efficient.

Subsystems of Speed Racer:

Our vehicle Speed Racer had many unique subsystems. For example the braking system used was a drum brake system. We had no past experiences or reasons as to why alumni chose this type of brake system. Albeit, based on our past knowledge on brake systems, we came to the realization that a drum brake system was a better choice because disc brakes tended to scrub which resulted in more resistances with the tires. Another major subsystem for Speed Racer was the steering system and the past students went with pivot arm steering. This system was chosen because it allowed us to adjust our steering when needed. Speed Racer was a rear-wheel drive with three wheels that was powered by a Scott Motor. What the motor was used for was to place the gears on the tire and on the actual motor. The two gears were then connected by a lawn mower chain.

Considerations and Issues of Speed Racer:

Speed Racer had many good attributes. First off, one of the major advantages that Speed racer had was that it was a kit car. A kit car is a car that is pre-pieced out, already coming designs made by the company manufacturers. Being that this car was assembled 20 years ago by the students of the program of the time, it still held up very well. Being first time Electrathon pursuers, Speed Racer was assembled effectively, from the roll bar down to the spindles. Speed Racer had the desirable length and width of any race car participating in an Electrathon. The car's length being 71" came out to be perfect for an average sized driver. The width was also an advantage, allowing the driver to be comfortable once seated in the vehicle. The height of the vehicle 34" also met the height requirement. This car was built using 1¾ in .065 walls of mild steel. Speed racer consisted of a double A-Arm suspension; the double A-Arm suspension was tied together by rubber bushings. On the rolling resistance point of view, Speed Racer had the lowest rolling resistance out of all three of our vehicles. The drum brakes created the least amount of scrub during competition. This allowed to us to utilize it as a reference for the other two cars we built this year.

Despite its advantages, Speed Racer also harbored many defects as well. To start off, speed Racer had issues with the steering system. This was because the system used for the steering was that of one that would was used on a go-cart. The car was very difficult to align and to correct the steering. The kingpins were tough to work with and the rims were very old. The aged out rims had caused us to struggle with the brake system, reason being that the old rims had a very small drum brake system, one that did not fit with the newer rim models. This caused Speed Racer to be unable to be upgraded to the newer rims and brake system without a radical design. Secondly, the frame of the body had holes at the joints where it had been welded together, and also some over bent pipes. The wheel connection system, being the two giant front spindles and the rear swing arm, both had major problems as well. The spindles were hard to adjust and did not allow us to play with them to figure out the right adjustments, and the rear swing arm was crooked. Normally, this would not be a big problem, but in this case, the way that the metal was facing did not allow the rear wheel to sit straight down the middle, causing a resistance problem that the rear wheel had the gear attached to it. This in the long run led to a higher rolling resistance and for the alignment of the car to be thwarted.

VI. Composites

Concept:

The basis of any composite material is two or more different materials combined to make a stronger and more refined product. Composites has evolved from the mixing of mud and straw to the combination of fibers and resins. The most common types of fibers are fiberglass, carbon fiber, and Aramid fiber. Fiberglass is fibers of glass weaved together. Carbon fiber is interlaced carbon filaments. Aramid fiber is commonly known as Kevlar and is made of synthetic fibers. The different types of resins consist of epoxy resin, polyester resin, and polyurethane resin. When the resin and fiber weaves are mixed together, the resin serves to hold the fibers together while the actual fiber provide structure and strength to the desired product. Using composite material has the advantages of low weight, high strength, and structural properties when compared to the usage of heavy metals such as steel.

Pulse:

Last year, it was decided that Pulse was going to be the only vehicle that was going to Florida for the race, but this year we are now bringing three vehicles to the Emerald Coast Electrathon: Speed Racer, Pulse, and Inertia. Last year's composites team took the liberty to attend Cerritos College and take Fiberglass and Plastics classes with Mr. Terry Price and Mr. Fergus O' Farrell to expand their knowledge on composites so it could be applied to our electric vehicles. The design of the body for Pulse was based on a constant velocity equation called Power Calc. ($P= [W * Crr + ½ *P * V^2 *Cd * A] *V$). This equation accounts for the mechanical aspect of a vehicle and its aerodynamics. The main objective of any car body is to protect the driver and to be as aerodynamic as possible. The aerodynamic part of the equation deals with velocity, coefficient of drag, density of air, and frontal area of the car. At the beginning of the year, the design team had designed a body for composites; however, it was not until a month later that we discovered that the body's width violated the Electrathon rules and so composites had to think of a brand new idea for a body with the limited amount of time available. The mold for Speed Racer consists of two parts: the top and belly. The plug is currently located at The Los Altos Academy of Engineering. The mold for Inertia is actually the original plug for Speed Racer that is compartmentalized in three separate parts and is currently at Cerritos College. As of now, the composites team has been taking night classes at Cerritos College Monday through Wednesday from 6 P.M. to 9:30 P.M. to work on the body.

Original Pulse Body and Issues we Faced:

Last year, the Composites team planned to produce their own mold to make the fiberglass body. We had design print out the actual sizes of the panels that would make up the body. The panels would align along one long tool, making the actual plug. To make the panels, we first cut out each panel and traced it along old whiteboards. We would then cut out each of the panels and place it accordingly to the design. A single slot would then be cut into each of the upstanding panels so one long whiteboard piece would go through each of the panels to ensure stability. We would then fill up each of the empty slots with expanding foam. After all of the slots were filled with expanding foam, we would then sand everything down to the desired curves and sizes of the plug. Afterwards, we would then laminate the foam with two separate layers of epoxy resin. Once that was accomplished, we would then apply bondo to fill in any holes. After the bondo was cured, we would then sand and smooth that layer down to accommodate for the final layer of gel coat. To make sure the mold was at its highest level of sleekness, we would wet sand the piece. Wet sanding is when the mold gets wet from water and then 220 ply of sandpaper would be used to smooth everything down. Gel coat would then be painted onto the mold and that would also go through the process of wet sanding. Then several layers of wax would be applied to the body so it would make it easier to remove the body after everything was finished. After the process of making and preparing the actual plug would be completed, we would then move onto the actual fabrication of the actual fiberglass body. To make the body, we planned to do a splash mold because it was a much quicker process. We would first apply several layers of fiberglass that was already lathered in epoxy resin over the plug. After the wet lay-up process, we would then wait a few days for the body to cure completely. The final step would be removing the body from the plug.

One month into the process of fabricating the mold and body for Pulse, we discovered that the width of the body violated the rules of the Electrathon. Composites was faced with making a brand new body for the race with even less time.

New Pulse Body:

The Pulse body originally had its own design; however, since the design violated the rules of the Emerald Coast Electrathon, we had to discard that design and make an entirely different body. Due to the limited amount of time left to make a body for Pulse, we were forced to create a composite body consisting mainly of fiberglass panels. The top panel of the body consisted of four layers of fiberglass with the dimensions of 29 inches by 32 inches and was laminated with epoxy resin. The 29inx32in side panels were much thicker and more rigid because it contained one layer of Core mat between the two layers of fiberglass while the top panels for the body just had fiberglass. Core mat is a polyester nonwoven that is used in lay-up processes to increase stiffness. The bottom pane of the body was 21 inches in width and 68 inches in length. The bottom side had one layer of Core mat sandwiched in between four layers of fiberglass to guarantee durability (Two layers of fiberglass, then one layer of Core mat, and then two more layers of fiberglass. The back panel had to have one big curve to account for the bars in the back of the vehicle. To make the curve, we prepared a plug made of cardboard and bent it to the desired curve and rested it on the actual vehicle where the lay-up process was going to take place.

The process to make all the fiberglass panels is called wet lay-up. The first step to making the top panel was to lay up the fiberglass and laminate it with epoxy resin. That was then repeated for all four layers. To make the side and back panels, we first laminated one layer of fiberglass and then applied one sheet of Core mat. After the Core mat was sealed with epoxy resin, the last sheet of fiberglass was laid over it, making a fiberglass sandwich. The bottom piece was produced using the same process, but two layers of fiberglass were coated with epoxy resin before the middle sheet of Core mat. After the Core mat was layered with epoxy resin, two more layers of fiberglass were then covered over it. One last sheet of perforated film was then placed over the laminate to seal it together. Perforated film is thin sheets of plastic with holes in it to allow any excess resin to escape through it.

Our main objective of the body was for it to be easy to assemble and to remove so the race team in Florida would be able to work on the electrical component of the vehicle without any complications. To accommodate for the back bar located in the back of the vehicle, we decided to make a one-piece rounded cover. We resolved to perform a wet lay-up on the actual vehicle because it was much faster and easier for our team. We first rounded a piece of cardboard to cover the back part of the vehicle that covered only a part of the wheel, which would serve as our mold. We then covered the cardboard with nylon so the epoxy resin would not seep through the cardboard and get onto the vehicle. Once that was done, we applied one layer of fiberglass and soaked it in epoxy resin. After that was done, we applied a second layer of Core mat to ensure rigidity. The last and final layer for the back cover was another layer fiberglass. We made sure that the fiberglass went over the row bar so it would stay in place while in Florida. After everything was covered in epoxy resin, we covered the layup with plastic to make the cover smooth so anyone handling it in the future would not get splinters. Once the product was cured, we de-burred the ends and drilled a hole in the bottom section where it covered the wheel. De-burring is a modification process that removes any protruding/undesirable parts of the body. The plan was to bolt the bottom sections of the cover to the wheel so it would not move.

The bottom pane was then bolted to the bottom of the vehicle and had several tabs protruding upwards, which was where the Velcro strips were located. Velcro strips were used to connect the bottom panel to the two adjacent sides, making it easier to take apart and work on the vehicle at the race.

Pulse Front View

Pulse Side View

Pulse Battery Box:

The Pulse battery boxes were just going to be covered on all four sides with small, three-layered fiberglass panels. The four boards were then joined together with “L” brackets to guarantee inseparability. The panels were made of three laminated layers of fiberglass laid over each other to provide strength and lightweight. The sides of the battery boxes were then connected to the actual body by more “L” brackets. “L” brackets were fiberglass strips that cured in the “L” shape and were used to connect the battery boxes to the side panels of the vehicle.

Pulse Bumper:

The main objectives of the Pulse bumper were to absorb impact and to be detachable. The reason why we wanted the bumper to be detachable was because the electrical team needed to be able to get to the electrical components of the vehicle while at the race. Since the steel pipes of the chassis were ¾ inch in diameter, we ordered ¾ inch filled PVC and had it lathed to fit to the inner diameter of the pipes. The PVC was then bolted onto the front of the vehicle, leaving eight inches of the PVC sticking out of the vehicle. To make the bumpers detachable, we decided to make carbon fiber pipes that could slip on and off the bolted in PVC when necessary. The first step in producing carbon fiber pipes was the preparation. We first obtained a ¾ inch in width PVC that was around 12 inches long and tightly wound a layer of nylon around it. We then wrapped the first layer of nylon with packaging tape over it. After that, we covered a second layer of nylon loosely around the PVC. A second layer of packaging tape was then also lightly wrapped around it, leaving a small, but significant air space between the PVC and second layer of fiberglass. The air pocket made it easier for us to remove the carbon fiber pipes from the actual PVC pipe once the produce was cured. After the preparation of the pipe was finished, we wrapped a long, thin strip of carbon fiber all along the pipe. As the carbon fiber was getting wound around the pipe, we applied epoxy resin along the pipe making the strips of carbon fiber stay together. Two layers of carbon fiber were wrapped around the PVC to ensure configuration of pipes. After it was lathered in epoxy resin, we then tightly wound electrical tape over the carbon fiber to ensure structural integrity. The steps were then repeated four times to make a pipe for each corner of the front square of the chassis. After it had finished curing, we then cut each of the pipes to the same length of eight inches. The carbon fiber pipes were then bolted onto the PVC pipes that were extending out of the electric vehicle.

After everything was bolted on, we then wrapped nylon around all four extended pipes of the vehicle, making an effective plug to do a lay-up off of. Two layers of fiberglass were first laminated with epoxy resin and then wound around the plug, making a box to a certain extent. After the four walls of the bumper had cured, it was then pulled off so the bottom layer of fiberglass could be laminated onto the bumper, making a box-like bumper. After the bottom layer had cured, we then put four carbon fiber pipes into each corner of the bumper and filled a part of the bumper with expanding foam. Expanding foam is a product consisting of two chemicals, that when combined, produce foam that expands and then hardens. The bumper was then reattached to the actual chassis. The attachments would be where the carbon fiber pipes were first bolted onto the extended PVC. Then, when necessary, one could just remove the bolts, thus removing the bumper as well.

Carbon fiber pipes

Fiberglass Bumper

Speed Racer:

Speed Racer Body:

In order to make the body of Speed Racer, we decided to use a mold we had available that was used in previous races. The mold wasn't kept in the best condition, so our team started off with cleaning and fixing up the dirt and cracks. For the next step, we planned to wax the mold as much as we could. Then, we were going to perform a wet lay-up of 4-6 layers of fiberglass on the two pieces of the mold. The two parts of the mold consisted of the top mold and the bottom belly pan mold. After the pieces would be laminated, we would then be able to separate the piece from the mold and de-bur the rough edges. For the sake of time, the body would only consist of the rough fiberglass layer. Lastly, the body would then be fitted onto Speed Racer's chassis and the edges would be shut with nuts and bolts.

Speed Racer Body

Speed Racer Belly Pan

Speed Racer Battery Box:

Speed Racer is using two Power Sonic batteries for the race. For the battery box, we decided to create one that would hold both of the batteries, instead of making two separate ones. To start off making a quick mold, we used the cardboard boxes that the batteries originally came in. We cut off the sides and combined the two boxes with packaging tape in order to get a box that would fit in the spaces in the car. When we were sure that the box fit in the car and that the two batteries fit inside, we covered all of the outside part of the cardboard box with packaging tape. The cardboard was covered in order for the battery box to have a smoother side on the inside after the lay-up. Next, we filled the cardboard box with expanding foam to ensure that the cardboard would not concave inward during the lay-up and curing process. Then, fiberglass pieces were cut according to the dimensions of the box. The corners of the rectangle shaped pieces of fiber glass were cut diagonally toward the base shape of the battery box. With the cut corners, we were able to overlap the corners to have a stronger base for battery box. Next we covered the three layers of fiberglass with epoxy resin. While the resin was curing, the box was faced upside down in order for the excess fiber glass to be turned outward. A plastic layer also covered the battery box so that the outside layer would be smooth and ensure less wrinkles or air bubbles. After curing, the plastic was then peeled off. We then carved out the expanding foam inside and pulled out the cardboard box mold from the battery box. After de-burring the corners and sides, we made a lid that was created in the same way as the battery box. Two slots were cut into the side closest to accommodate for the terminals in order for the electrical wires to be connected to the vehicle. A layer of breather cloth was glued in the inner layer of the battery box. In the middle, we inserted a slot of foam in order to fill the extra space between the two batteries. The foam was then set with epoxy resin and supported with four strips of fiber glass. Finally, we de-burred the bottom of the battery box to make sure that there would be no harm done to the wires of batteries during the race.

VII. Public Relations

Working with Project Management we executed the plan needed to take Project Pulse and improved Speed Racer out to race. Mr. Robert Franz, a former instructor at LAAE, introduced us to the competition. Our goal was to create a student-built electric vehicle Project Pulse to compete in the Emerald Coast Electrathon in Pensacola, Florida on April 27. Another goal was to have our vehicles drive 30 miles in an hour.

We participated in the yearly advisory meeting that took place in October 2012. Advisory involved La Puente Valley Regional Occupation Program board members. They decided whether engineering should continue next year. Each team created a power point covering our goals set for the Emerald Coast Electrathon and other activities over the course of the year. The forms required for Advisory were the Engineering and Pre-Engineering outline, Curriculum Validation, Agenda, and meeting minutes.

In order to reach the projected $10,000 cost for transportation and other expenses for participating in the race, we did community outreach in the form of school events, advisory, newsletters, Open House, Richard Irwin, and the Adopt-An-Engineer fundraiser. In the first week of September, we took advantage of Club Rush week at Los Altos High School. We gave incoming freshmen new brochures made by Leon Liang and presented a tri-fold that displayed each teams' roles. December of 2012 was Los Altos High School's annual Open House for parents and students interested in joining clubs. In addition to that, we were able to bring Speed Racer and Project Pulse to the gym to display our work.

In order to inform our sponsors and the community of our activities, we sent out our first newsletter in December 2012 covering Robotics National Mini Urban Challenge, LAAE students attending Cerritos College to learn composite material bonding, and the incorporation of telemetry to Project Pulse. During this time, Michael Valdez also contacted Richard Irwin from the LA Tribune to help interview our members and create a news article featuring our current projects and goals. As a result, more people became interested in our program and we received more donations.

Our first electronic issue and printed newsletter was sent out in January 2013 which focused on the Fundraising Committee, improvements made to Project Pulse, benefits of making these improvements, and how the Robotics team competed in the December First Tech Challenge. We added a “Thank You Sponsors” list in the newsletters for the rest of the year in conjunction with the Adopt-An Engineer fundraiser to help thank our sponsors. We also started using Facebook to help publicize our activities. Originally we used Twitter but stopped because we realized that more people used Facebook. With this transition, we got followers from outside the program to support our cause.

We did not make a newsletter for February because there were no major activities. Our third newsletter in March 2013 covered Freshmen Robotics’ success at the First Tech Challenge, Senior Robotics success at Regional Mini Urban Challenge, and further updates to Pulse and Speed Racer. The last newsletter was released May to cover the Fundraising Committee’s success in raising $10,000, 2013 Open House, and results of Emerald Coast Electrathon.

Regarding yearly activities, our 2013 Open House was held on April 13. We did not use the gym because it would cause inconvenience. We put posters up throughout the campus, nearby streets, and sent out notifications to important board members through mail. We used Facebook to set up the event, recruit volunteers to help prepare for Open House, and invite any people who were interested in attending. The event was scheduled for 10:00 AM but students arrived at 8:00 PM to set up. Our members were required to wear their Engineering T-shirt to show unity within the program. In order to plan for this event, our Booster club meeting was held on April 8 to explain what items we needed people to bring, as well as what events we would host. We decided on hosting a silent auction as well as a raffle. Items in the silent auction had a base price of $25. Raffle tickets were $1 per ticket, $5 for 6 tickets. We decided that parents could help Catherine Barnes, the new booster club president, to prepare hotdogs and other food at her house on April 12. This year we did not use a free meal ticket system. A meal which includes chips, soda, and a hotdog is $5. Fruit would cost $3. After Open House, we realized that we should have contacted sponsors a month ahead of time to prevent any conflict in donations. Not as many people participated in Open House, but we did manage to gain $800 in profit.

In addition to Facebook, Open House, and other community outreach efforts, we used Pizza Co. and "Adopt-An-Engineer" to fundraise but did not do McDonalds or car wash fundraiser because there was not enough time.

In order to recruit more students for next year's program, we sent out applications on April 8. Interviews were scheduled for April 15 and 17. These efforts were successful in helping our program expand community outreach and earn donations to fund our participation in the Emerald Coast Electrathon. The following section will go into further detail about the Fundraising Committee.

Fundraising Committee:

We reestablished a fundraising committee to raise funds in order to cover for the airfare, transportation, gas, food, and lodging expenses of the students participating in the Emerald Coast Electrathon. The committee consisted of junior Jacob Barron, sophomore Connie Pung, sophomore Airi Fukushima, and sophomore Patrick Young. Based upon online research, the students estimated that the total cost was about $10,000.

The fundraiser proposed by the committee was called Adopt-An-Engineer. Sponsors could choose which student engineer to fund. In turn, sponsors had their names listed on upcoming newsletters, received a thank you letter, and received a biography of their student engineer. Each student engineer of LAAE was required to raise $50, which amounted to five sponsors and a $10 donation per sponsor. The Adopt-An-Engineer fundraiser is tied to the Los Altos Academy of Engineering Booster Club.

Due to our close connections with former sponsors and alumni, the fundraising committee contacted those advocates to participate in the Adopt-An-Engineer fundraiser. The committee contacted alumni such as Anna Wu, Robert Pfeffer, and Nikki Kodama to critique their presentation skills. With a higher level of presenting experience, the committee then contacted local organizations such as Kiwanis Club, Rotary Club, and the Lion's Club. Every club donated around $200 to our project. The committee's biggest accomplishment is the $5,000 donation from Mr. Dickie Simmons, field deputy for supervisor Don Knabe of the Los Angeles County 4th District. Public Relations also worked alongside with the Fundraising Committee to send out newsletters of our progress in donations, and recognize the supporters who donated. As a result of Adopt-An-Engineer's success, the committee raised $12,000 in funds.

VIII. Future Considerations

Since the chassis for Pulse was finished in the year of 2011-2012, the completed composite body and electrical components were added as well. Our race team competed in the Emerald Coast Electrathon in Florida, racing both Pulse and Speed Racer.

Even though both of our vehicles were completed, they did not come out as originally planned. We had many issues concerning Pulse's chassis. For example, the original swing arm did not follow the Ackerman angle. We also added triangular supports to reinforce the chassis and to make it safer for the driver. Our plan for any future project is to focus mainly on the suspension, steering, bumper, and chassis. We intend for our vehicles to have stronger stability and better aerodynamics.

In regards to the mechanical facet of our project, we learned that we did not need as much tubing then we used. We also realized that we need to know where we are going place our batteries and our ballast before we start building the vehicle to avoid future complications.

As far as the electrical aspect of the vehicle goes, there were a few problems that had to be dealt with. One of them was the incorrect wiring of telemetry into the vehicle. This caused the vehicle to malfunction to the point where it would not even turn on. Even though we were unable to utilize telemetry in our both Pulse and Speed Racer, we plan to use telemetry on future projects. One other minor issue that we encountered was the potentiometer malfunctioning and, in turn, disrupting the performance of the motor controller which stopped the vehicle from running. This error forced Speed Racer to be pulled out of the race for half an hour. Fortunately, we were able to discover and resolve the issue, the potentiometer was not correctly calibrated or zeroed out. We also had a problem with the hand isolator switches. They were too large when placed on the vehicle and they rubbed up against our driver, making it difficult for her to get in and out of the vehicle. We fixed this problem by ordering switches that were not as long and did not bother our driver. We also plan to calibrate the cycle analyst to the correct ratio of the shunt so that it reads the amperage of the vehicle correctly.

The original body design for Pulse was never made because it violated one of the Electrathon rules. We were forced to make the body out of fiberglass panels. Despite our mediocre body for Pulse, we obtained valuable knowledge concerning the fabrication of fiberglass. With the help of Mr. Terry Price and Mr. Fergus O' Farrel from Cerritos College, we hope to create a more sophisticated composite body for our future projects.

In terms of the Public Relations future, a more convenient way of keeping track of Adopt-An-Engineer is for each student to list his or her name and sponsor on a list posted inside of Public Relations so that thank you cards and bios can be sent out accordingly. There are also other fundraising opportunities such as food trucks and raffles which can be utilized during Open House or whenever Los Altos High School hosts an afterschool food truck gathering. Public Relations should contact Mr. Harrington for a food truck and sports game schedule so we can take the opportunity to fundraise after each sports game. Catherine Barnes, the new Booster Club President, has been an important benefactor in reaching out to other companies to help host fundraisers for LAAE. Seeing how successful Adopt-An-Engineer is, we will continue it next year for the next Electrathon.

Due to the many issues met with Pulse, our team decided to fix them by designing and building a new electric vehicle based on the mishaps of Pulse. Pulse will be a retired vehicle that future students can come back to when building a new project. Our new vehicles will be designed with the same goals as Pulse, except with more regard to the errors we encountered while constructing Pulse. With our experience from the past years, we will apply our newfound knowledge towards building successful, future endeavors.

IX. Appendix

December 2012

BUILDING A CLEANER, MORE FUEL EFFICIENT TOMORROW.

LAAE

From Intro to Robotics Amateurs to National Competitors

Students from Los Altos High participate in ION's Mini Urban Challenge.

By: Kimberly Hsu

At the first Regional Competition held in the John Deere Building in California on March 24, two teams from the Los Altos Academy of Engineering experienced their second robotics competition. Team 1 consisted of juniors Jerry Wang, Kevin Morales, Marcos Avila, and Kimberly Hsu; seniors Nick Pung and Ivan Wang; and former senior Samuel Chia. Team 2 consisted of sophomores Kenneth Hirscht and Michael Chang, both of whom were currently enrolled in the Introduction to Robotics class at Los Altos High School at that time. Both teams had created their own customized robots and programmed them according to competition rules in order to autonomously navigate through the large Lego city. Team 1 would then progress to the national competition in the National Museum of American History in Washington D.C. on May 26.

Team 1 at Nationals Left to Right: Marcos Avila, Samuel Chia, Kevin Morales, Ivan Wang, Nick Pung, Jerry Wang, Kimberly Hsu

The students were first introduced to ION's Mini Urban Challenge through Joan P. Inouye. The competition sparked the LAAE students' interests because a new type of opportunity to succeed was available. Not only would this competition incorporate what they had learned in Introduction to Robotics, but also expand upon their current programming knowledge by experimenting with new elements within the programming language RobotC. This knowledge was put to the test in the Regional Competition where the teams were required to create a robot using an NXT robot brain, Lego parts, and color sensors. The robot would then have to navigate without any human interference through a scale model of a city. The robot was required to follow traffic rules by reading color values and carrying out the specific programmed reaction.

In addition to having the robot autonomously navigate the scale model city, both teams were required to present their robot in front of a panel of judges. Mr. Mitch Kodama, a key supporter, visited LAAE a few weeks prior to the regional competition to provide advice on both teams' presentations. For Teams 1 and 2, the presentation would potentially be the determining factor between earning first, second, third, or no place at all. Both teams had already experienced difficulties on the competition mat. "During the one hour period to test the robot and score points, we continuously made changes to the robot's program in order to maximize efficiency. We had trouble deciding whether to choose the untested program that could potentially score a lot of points or the program with the simplest route that didn't score as many points," Marcos Avila says. Team 1 took second place and earned the Best Presentation Award while Team 2, although not winning any awards, was able to go home with the priceless rewards of knowledge and experience.

On May 26, LAAE Team 1 participated in ION's Mini Urban Challenge in Washington D.C. at a national level. They were confident in succeeding for a second time. Their robot had undergone new structural and programming changes prior to the national competition. This time all of the participating teams faced difficulties in the robot navigation section of the competition. "The dim lighting within the building made it hard to calculate exact color values. Some parts of the mat were illuminated while others were not. I could see robots from other teams spinning out of control because of this difference," Nick Pung states, "We weren't sure who was going to win at this point. All we knew was that now the presentation was vital to the final scoring." Teams from across the country, including LAAE Team 1, patiently waited for the last point to be tallied.

Although LAAE Team 1 did not win an award, its members knew that if they had come this far with all their efforts, they could do it again. Members of Team 1 did not return home with their heads lowered, but with confidence that the experience gained from this year's competition would be valuable for next year's competition. Ivan Wang proudly stated, "I hope we can once again advance to the national level. But this time we'll be familiar with the playing field and we're confident to place in the top two."

Pulse's Shell

By: Derek Ho

Students use composites to build Pulse's shell.

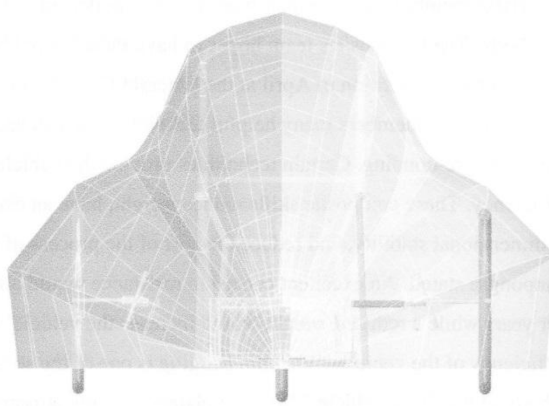
Ashley Ho prepares to build the cross section model of Project Pulse.

One of the rules in the Electrathon America rulebook that Project Pulse abides by states "All vehicles must provide a body/chassis structure sufficient to protect the driver from any side. A suitable structure or shell is required to provide a barrier between the driver and any contact with another vehicle or the ground." To fulfill this requirement, the Composites team of the Los Altos Academy of Engineering has sent several members to Cerritos College to obtain knowledge about composites from Mr. Terry Price and Mr. Fergus O'Farrell, both of whom teach the class, Plastic Manufacturing Technology for Fiberglass Fabrication, PMT 61. Mario Gonzalez, graduated senior; Thomas Shaihor, graduated senior; Alanna Ho, senior; Ivan Wang, senior; Ashley Ho, junior; and Alisa Smanpongse, junior carpools to attend the class once a week. These members are currently making scale models of Pulse before constructing the actual body. The Composites team hopes to have Pulse's final body finished before February in time for the competition in April at the Emerald Coast Electrathon, Florida.

PMT 61 has taught the six members many helpful techniques such as vacuum bagging, nomex honeycombing, and core-bonding. Certain techniques provide the vehicle with stronger stability and better efficiency. These composite skills reduce weight, have an excellent corrosion resistance, dimensional stability, and reduce the cost of the process of making the vehicle's shell," Smanpongse stated. An excellent corrosion resistance would allow the vehicle to run even in its later years while a reduced weight would increase the vehicle's speed, benefits which improve the efficiency of the vehicle. "Vacuum bagging is one of the several ways to efficiently make the body of the Pulse vehicle," Wang explained. "Using atmospheric pressure as a tool, the process of vacuum bagging laminates simple molds into a wide range of functional shapes by removing the air that could potentially weigh the vehicle down. There is much more that can be done with the new composite knowledge. "

Cerritos College had helped the Los Altos Academy of Engineering in 2006-2007 as well. Price also helped LAAE construct the body of the Infusion vehicle. LAAE is grateful for all the help from Price, O'Farrell, and Cerritos College have provided. Wang says, "I want to create a larger base for my career as I plan to study chemical engineering." Ho explained, "Not only do these skills help in Project Pulse, but they are also useful in the real world especially with airtight products." The team's expansion in both members and knowledge, will determine the success of Project Pulse.

While students from the Composites team are making the model, they still go to Cerritos College every Monday from 6 P.M. to 10 P.M. to learn from O'Farrell. LAAE intends to use the new knowledge to construct the body of Pulse. The Composites team is building two models of different sizes to exactly replicate the body of the vehicle. The two models allow LAAE to more easily visualize and build the vehicle. The body of the first model is built on a one-to-one foot scale and should look similar to the actual vehicle. The second model is built on a one-to-five foot scale with one being the model and five being the actual vehicle. The models will be made using cross sections, which outline the body of the vehicle. Project Pulse is progressing toward Florida's competition.



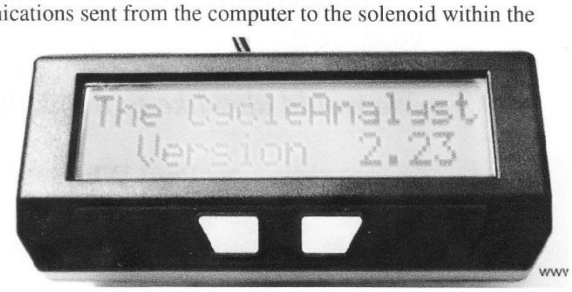
Design of Pulse's Shell front view

The Use of Telemetry

LAAE students use modern technology to make the driver safer.

By: Robin Gao

LAAE has been working on Project Pulse, its new electric vehicle, and has incorporated a strategy called telemetry. Telemetry is the observation and analysis of electrical data at a distance. It was introduced to the IT (Information Technology) team by Mr. Robert Franz to improve driving safety. By using the Cycle Analyst, which is an electrical component that measures voltage of the battery and other information, the team will be able to receive information from the car wirelessly. The shifter will convert TTL from the Cycle Analyst into serial data and wirelessly send the data to the serial port located on a computer. The team also developed a program to display all of the information. The data allows for the team to tell the driver how to drive more efficiently and avoid being distracted from the road. For instance, if the voltage is relatively high, the team will tell the driver to accelerate the vehicle. If the voltage is relatively low, the team will tell the driver to slow down in order to save more energy. It took the team one month to develop the telemetry program written in Visual Basic 2010 (VB). Live video feed from cameras installed in the vehicle will view the road and driver. The computer programmer uses wireless communications sent from the computer to the solenoid within the electrical system to shut down the vehicle during an emergency. Through telemetry, the driver will be able to drive safer and more efficiently, and concentrate on the road condition.



Cycle Analyst provides information about the battery and other critical information.

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"Thank you for making our spirits soar through the power of imagination."

Vern Moyer:
"I wish you the best of luck with your plans."

Norma Manning:
"Proud of your program."

Brad Manning:
"I wish you the best with the "Pulse" car in Florida good luck!"

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Paul White

Kathy Young

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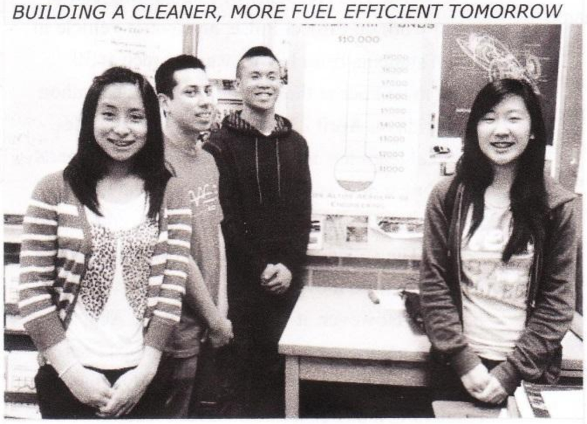
January 2013 Edition



Donations are measured by a fundraising thermometer.

From left to right: Airi Fukushima, Jacob Barron, Patrick Young, and Connie Pung

Pulse Aiming for the Emerald Coast Electrathon

By: Airi Fukushima

The Los Altos Academy of Engineering has been working to prepare our electric vehicle, Pulse, for the Emerald Coast Electrathon race in Pensacola, Florida on April 27th. This year, the fundraising committee has been revived and has started the "Adopt-An-Engineer" fundraiser to support this project. This race will consist of two one-hour runs, and our goal is to race Pulse for thirty miles in an hour. Due to the fact that there are no local races, our team is determined to race at the Emerald Coast Electrathon. The traveling expenses will be roughly around $10,000. For this goal to become a reality, the fundraising committee is currently raising funds to support our team and prepare for the race.

In order to raise $10,000 before the race, the fundraising team has established a new fundraiser, called "Adopt-An-Engineer". In this fundraiser, each member

UPCOMING DATES

February 2: Robotics First Tech Challenge

February 6: Booster Club Meeting

March 16: Robotics Mini Urban Challenge

April 13: Open House

April 17: McDonald's Fundraiser

April 20: Car Wash Fundraiser

April 27: Emerald Coast Electrathon

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Website: www.lasv.org

15325 E. Los Robles Avenue,

Hacienda Heights 91745, CA

from the program will participate as an engineer for donators to adopt. The donators may choose their own engineer or the fundraising committee can offer one. Once an adopter has donated to our project, he/she will have his or her name featured in the LAAE newsletter; receive a letter with a biography and picture of the engineer that was adopted, and receive a thank you letter.

The members of the fundraising team are Jacob Barron, Patrick Young, Connie Pung, and Airi Fukushima. Jacob is currently in mechanical team as well as the fundraising committee. He is working with Patrick as the spokesmen of the team. Connie and Airi have contacted LAAE alumni, such as Anna Wu and Robert Pfeffer in order to get advice in how to proceed. The fundraising committee has also presented to the Kiwin's Club, Rotary Club of Industry Hills, and Mr. Dickie Simmons, the field deputy for Don Knabe. As of current, the team has raised $5,500 in total for this project.

By raising $10,000 to help LAAE race at the Emerald Coast Electrathon, the fundraising committee will commit to helping the team by gaining support from the community and encouraging donations from various organizations."Adopt-An-Engineer" fundraiser will be one of the greatest impacts in supporting this project. "Fundraising can be very hard work, but it pays off in the end," says Patrick.

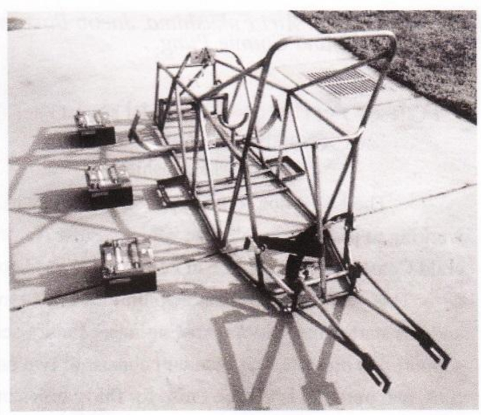
The fundraising committee would like to thank all of our sponsors for their continued support and generosity. For further information about Project Pulse, the fundraising committee is available at **laaepublicrelations@gmail.com**. For donations, our Booster Club Tax ID number is **27-0111547** at **Los Altos Academy of Engineering Booster Club.**

Steady Pulse

The improvements of the electric vehicle Pulse.

By: Brian Ku

The Los Academy of Engineering continues to work on Project Pulse, an electric vehicle in which students from LAAE want to race at 30 miles in an hour at the Emerald Coast Electrathon in Florida on April 27, 2013. This year, the Mechanical team has improved many of Pulse's parts including a new swing arm, king pin plate, king pin, triangular supports, cross member, and battery boxes. The swing arm is a mechanism that allows the car's tail to move and absorb bumps with suspension. However, it did not follow the Ackerman angle, a geometric arrangement that stops tires from slipping when turning. This disadvantage resulted in a power loss whenever Pulse made a turn during test drives.



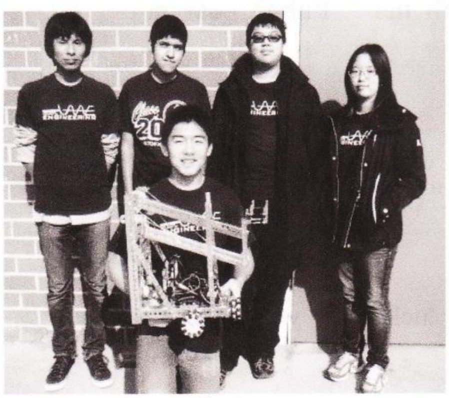
Pulse's chassis consists of welded steel bars. The car will require three 12Volt batteries to run.

A new king pin plate has been designed to allow for easier alignment adjustments, camber, and toe angle of the car. In order to prevent the kingpins from bending or even snapping, the diameter was increased. Triangular supports were added to fortify the chassis. In case of a crash, the triangular support would lessen the chances of Pulse's frame collapsing. The cross-member of Pulse was also redesigned. The welded cross member was replaced with a bent tube cross member because superheating metal makes metal brittle and weaker which makes it susceptible to shattering more easily. The battery boxes were also revised in order to keep the batteries in place and more stable. The bottoms of the batteries now lie against the side of the chassis. These changes will help keep the driver safe and make the car more efficient. "These changes in Pulse will allow us to improve our vehicle by increasing its efficiency and making it safer for our driver. It would also help us accomplish our goal of traveling 30 miles in one hour," says Samantha Liu, a Mechanical team member.

Robotics team competes in first tech challenge

LAAE Robotics team competes in FTC for the second time.

By: Kimberly Hsu



The senior Robotics team prepares for First Tech Challenge.

Top row from left to right: Marcos Avila, Kevin Morales, Jerry Wang, Kimberly Hsu
Bottom row: Nick Pung

On December 15, the LAAE Robotics team participated in First Tech Challenge at Webb School, Claremont. The team had to build an 18" by 18" by 18" robot out of Tetrix© pieces and program the robot to pick up and place rings on a 3' by 3' PVC rack. The Robotics team chose to create an omni wheel drive robot with a four- bar system attached to a motor propelled lifting mechanism. Competitors had the option of programming an additional infrared sensor to place specific rings on the rack, however; the Robotics team did not choose to program the infrared sensor because the coding of time constraints.

Each round consists of two teams forming an alliance against another alliance of two teams. In the last 30 seconds of the round, robots lift their paired team's robot to score points. The entire round lasts two minutes. In one of the adrenaline - rushing rounds, Robotics had the chance to work with students from Glen A. Wilson High School. After competing in three rounds, the LAAE Robotics team earned 14th place out of 23 teams.

Having signed up for two FTC competitions this year, LAAE passed the competition on to freshmen from Introduction to Robotics class. "I'm excited to see where we place in this competition seeing how this is our first time competing," says Michael Attanasio, a freshman from the Intro to Robotics team. They will be competing for the first time on February 2nd to earn new experiences while the senior members will be

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Norma Manning:

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Dickie Simmons:

"I am so proud of the outstanding quality of students produced by our high school (*Los Altos High School*)"

Mary Ann King:

"I wish you much success-and enjoy the journey."

Brad Manning:

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Gino Kwok:

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Vern Moyer:

"I wish you the best of luck with your plans."

Maureen Sinclair:

"Best of luck from Educational Services, *LPVROP*."

We would also like to thank the following:

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March 2013 Edition

UPCOMING DATES

April 8: Engineering Applications Available

April 13: Open House

April 15 & 17: Engineering Interview

April 27: Emerald Coast Electrathon

June 1: National Mini Urban Challenge

Following in the senior robotics team's footsteps, freshmen robotics team prepares to participate in FTC.

From left to right: Joey Chen, Eric Liu, Dominic Gonzalez, Michael Attanasio, and Andrew Rojas

FRESHMEN ROBOTICS WINS AN AWARD AT FTC

A team of freshmen compete and win an award at their first try in First Tech Challenge.

By: Kimberly Hsu

On February 22, five freshmen from Introduction to Robotics participated in the First Tech Challenge at Monrovia High School. The freshmen robotics team was composed of Andrew Rojas, Eric Liu, Joey Chen, Dominic Gonzalez, and Michael Attanasio. This was the first time they would compete in a regional robotics competition against other schools. Their main objective was to program, build, and control a robot that would place rings on a peg rack.

Attention Students!

Students not attending Los Altos High School may join LAAE's afterschool program by contacting Mr. Richter or coming in afterschool on Mondays and Wednesdays from 3-6.

erichter@hlpusd.k12.ca.us

They competed in five rounds. At first, they lost three rounds because they were inexperienced with the robot controls. They tied with the opposing teams in their fourth round but were penalized for the robot's contact with the opposing team's rings. In their last round of competition, they won the round by scoring two rings in the last few seconds. Their overall ranking went up six places. The team also had to present their robot in front of a panel of judges.

The team ended up placing 18 out of 24 teams, which is commendable considering this was their first time competing. Even though they did not earn any medal award in the competition, they did earn the judge's Gracious Professionalism award. "We were honored that the judges would bestow such an award on us," said Andrew Rojas. With FTC over, the senior and freshmen robotics teams are preparing for Mini Urban Challenge in the John Deere Building at Torrance on March 16.

VICTORY ONCE AGAIN AT MUC

Students from LAAE compete at the Mini Urban Challenge.

By: Kimberly Hsu

On March 16, two teams from LAAE competed at the 2013 Mini Urban Challenge at the John Deere Building in Torrance. The senior team consisted of juniors Marcos Avila, David Zhang, Jerry Wang, Kevin Morales, and Kimberly Hsu while the second team consisted of freshmen Michael Attanasio, Andrew Rojas, Dominic Gonzales, Carlos Delgadillo, Joey Chen, and Eric Liu from Introduction to Robotics class. The competition had the same rules and guidelines as last year: build a robot controlled by an NXT brick and program the robot to autonomously navigate through a simulated city.

The first part of the competition involved having the robots compete for one hour on the simulated city. The second part of the competition required teams to present the creation process of their robot. "The presentation aspect for MUC has taught us how businesses present their ideas to potential sponsors," said Marcos Avila. However, competition was harder this year because teams from last year are now more experienced.

The freshmen team, although not finishing in the top spot in the competition, is determined to pursue a place in MUC next year and is currently participating in a series of mini-competitions during Introduction to Robotics class. The senior team won second place in the regional competition, as well as an award for Best in Show. This means that the students on the senior team, which previously competed in 2012, get to compete in the National Mini Urban Challenge at the Smithsonian National Museum of American History once again. Last year the team won Best Presentation and took second place at the regional competition. With the help of alumni Aaron Mayeda, program supporter Mitch Kodama, and other benefactors, they are determined to place in the national competition this year.

The shell for the senior team's robot TANKY is made of styrene plastic and spray paint.

VEHICLE CHANGES AND UPDATES

An update of LAAE's process for Emerald Coast Electrathon.

By: Jason Gonzalez

Los Altos Academy of Engineering has made many recent changes and updates. First, LAAE will be competing not only with Pulse but with Speed Racer. It was decided that Speed Racer would be used in the Emerald Coast Electrathon because it was the first car LAAE had ever built, and the race would commemorate Speed Racer's 20th anniversary. LAAE is also currently building a new electric vehicle called Inertia. "We wanted to make improvements on Pulse, but the chassis was already welded. Inertia will have all the improvements planned for Pulse," said LAAE mechanical member Brian Ku.

There have been some significant changes to Pulse. The kingpin was made larger so that it would be less likely to bend or break when the vehicle is in use. New spindles were also created to accommodate the kingpin. Next, a new motor box and mount were created because the previous one was not as fortified. Cotter pins were put in the axel to abide by the Electrathon rules and to prevent the wheels from falling off if the locknuts were to fail. LAAE also added triangular supports to Pulse to better fortify the chassis. To prevent relying on weaker points in welds, the cross member had been changed from three separate pieces to just one. A five-point harness was attached in order to keep the student driver safe in the event of an accident. To better preserve battery power, the gear that was connected to the rear of the car had to be fixed. Due to time constraints, vehicles bodies' will not be finished in time for the race. The front bumper will be made out of composite material. Team member Ashley Ho says, "If the car crashed, the bumper would take most of the impact and collapse instead of damaging the frame or injuring our driver."

Speed Racer will also undergo several changes. First, a belly pan, which is made of composite material, will be put in because of the Electrathon rules. Since the brakes are currently dragging down the coefficient of rolling resistance on Speed Racer, they will need to be fixed and assessed for a new possible design. In addition, a red triangle will be incorporated in both vehicles around the isolation switch due to Electrathon rules. A telemetry system will be mounted to both cars as well to remotely monitor the power efficiency during the race.

Lastly LAAE is working on Inertia, which will most likely be raced in the next Emerald Coast Electrathon. So far there are a few designs of the chassis and a rough frame setup.

Inertia is currently a frame, but the completed vehicle will be used in the next Emerald Coast Electrathon.

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Norma Manning:
"Proud of your program."

Dickie Simmons:
"I am so proud of the outstanding quality of students produced by our high school (Los Altos High School)."

Mary Ann King:
"I wish you much success-and enjoy the journey."

Brad Manning:
"I wish you the best with the "Pulse" car in Florida good luck!"

Gino Kwok:
"Thank you for making our spirits soar through the power of imagination."

Vern Moyer:
"I wish you the best of luck with your plans."

Maureen Sinclair:
"Best of luck from Educational Services, LPVROP."

Michael C. Lewis:
"Passive Aggression: Never put your foot in it, never back off (Unless you have to)!"

Sheila & Ed Richter:
"Explore the future and enjoy the journey. Engage and conquer."

Jamie Shar:
"Best of luck, Samantha."

Maggie Torres:
"Best of luck to you on this endeavor! We're so proud of you, have fun!"

Alma Banuelos:
"So proud of you! Love, Aunt Alma."

Kai & Mari Eng:
"Go Conquerors! Win the race, Darren!"

Stephanie Jao:
"Kevin, proud of you, I would like to share with your success!"

Hector Olivar:
"I am very proud of you. Love you."

Cliff & Sandy Eng:
"Do your homework. Be prepared."

Jim & Carolyn Haboian:
"Good luck with Los Altos and keep up the good work!"

Sel Zamara:
"$10 to Los Altos Academy of Engineering and a great cause."

Alan Chen:
"I really hate this 15 word limit, always "Too Limited!" Good luck for OSU, bro!"

Rick Menius:
"Good luck. I am a Los Altos graduate (1966).Grandfather to Matthew Barnes."

Ron Williamson:
"Donated $100 cash! Can he be recognized somehow? :-)"

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Thank you to the following people for your generous donation and words of encouragement.

Robin Polito-Shuffer:
"Best of luck to you as you change the world!"

Liz Sanchez:
"Dream big Noe! We're proud of you. Endless opportunities await you. Put your mind to it and believe in yourself. Love, Sanchez Family."

W. Gilbert:
"Good luck in Florida, Kenneth Hirscht! Good luck in Florida, Ashley Ho!"

Brian & Pam Eng:
"Go Conquerors! Have fun and be safe!"

Doreen Eng:
"Good luck Darren and Kaitlyn! We're proud of you!"

Randy Hain:
"I'm an Engineer...no one adopted me..."

Lorena Eng:
"To Darren and Kaitlyn 'Engineer' Eng- Have fun!"

Clark & Renee Simonian:
"Keep up the great work!"

Vivian Hiyashi:
"Good luck to all the Engineers at Los Altos. Best wishes and much success."

Ana Alvarez:
"Very, very proud of you."

Hsinyih Su:
"All the best, Samantha! Love, Sabah's mom."

Joanna Eng:
"Happy Engineering, Darren and Kaitlyn! Good luck and drive safe Darren!"

Brenda Hernandez:
"Best of luck to Edgar and his team!"

Mrs. Piner:
"Best of luck!"

Kim Banda:
"Good luck!"

Sylvia Baldenebro:
"Go team Pulse! We are winners no matter what!"

April Ho:
"Good job!"

Bernice & Sabrina:
"We both wish you guys luck and hope everything goes well."

Emad Kalta:
"Good luck in your goals, and future in your school."

Basim Wassif:
"Good luck in Florida and enjoy this once in a lifetime opportunity."

Anne-Marie Prendiville:
"Congratulations Edgar! Good luck!"

Patricia Calvo:
"To infinity and beyond!"

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Thank you to the following people for your generous donation and words of encouragement.

Erendira Andrade:
"Los Altos Academy of Engineering, good luck on your new project. Bring back a win!"

Leticia T. Carrillo:
"Sky is the limit! Reach for the stars! Proud of you! Wish you the best! Love, Aunt Letty, Robert, Anthony, Manny & Brenda!"

JR Terrazas:
"Good luck Noe. We know you will make us proud. God bless you."

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Thank you to the following people for your generous donations and words of encouragement.

We would also like to thank the following:

Don Knabe
Patricia McIntosh
Nikki Kodama
Patricia Briglio
Bob Hsu
Craig Kamniski
Hector Ruiz
Sara Herrera
Ernie
Tracy Ramirez
Jaime Ortega
Rod Selbo
Richard Jimenez
Victor Rodarte
Nancy Betancourt
Bill Laliberte
Joey Sakata
Isabel Meza
Ivan Zelada
Yi-Chin Wu
Isha Chang
Alex Wang
Hsiu-Tzu Tang
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Kathy Young
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Pom Leawprasert
Anna Der
Chuck Yeh
JinJin Hantragoon
Sengkham Wu
Rose Yeh
Michelle Wang
Donna Dowe
Debbie Yeh
Mike Kalta
Yolanda Hirscht
Kenneth Hirscht
Sylvia Caballero
Richard Caballero
Mr. Panagos
Renee Barron
Adriana Chang
Jose Baldenebro
Maddy Baldenebro
James Jackson
Mike Baldenebro
Joe Baldenebro
Owen Wang
Yuhua He
Yuan Wang
Larry & Andre Rocha

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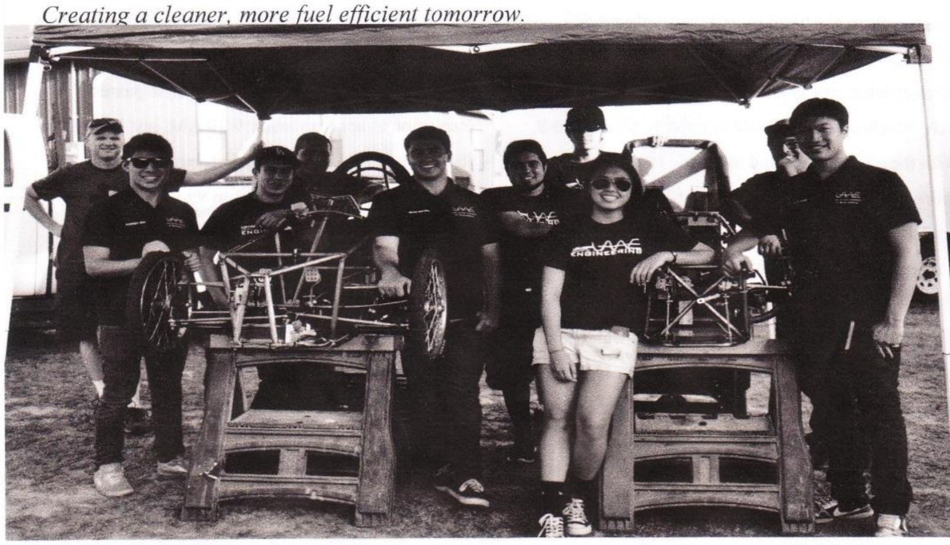
May 2013 Edition



From left to right: Mr. Richter, Jacob Barron, Jose Leyva, Will Cervantes, Javier Baldenebro, Michael Valdez, Alanna Ho, Edgar Millan, Ivan Wang
The racing team arrives at the Emerald Coast Electrathon with Speed Racer (left) and Pulse (right)

Emerald Coast electrathon

LAAE students participate in the Emerald Coast Electrathon in Pensascola, Florida.

By: Edgar Millan

On April 27, the Los Altos Academy of Engineering competed in its most challenging endeavor yet. A student team of nine, along with LAAE advisor Ed Richter, vice-principal Jeff Hess, and parent chaperone Sandy Eng, traveled to Pensacola, Florida to race in the Emerald Coast Electrathon, an Electrathon America race. This was not a competition of speed but a test of endurance and battery management. For the first time ever, the Emerald Coast Electrathon hosted teams from both the east and west coasts. Pulse and Speed Racer were the two vehicles that ran Saturday morning at Five Flags Speedway. Pulse was a two year project that was planned

This is the last newsletter for the 2012-2013 school year. Thank you for supporting the Los Altos Academy of Engineering throughout all these years.

in early 2011 and was started in 2012. Speed Racer was completed in 1993, making its run in Pensacola its 20th year anniversary. Speed Racer was one of the first vehicles to run in an American Electrathon. Speed Racer's entire electrical wiring was replaced and several pieces of equipment, such as a cycle analyst, a wireless telemetry system, and even a GoPro camera, were attached to the vehicle in order to modernize it. With the allotted time and available resources, the entire order to modernize it. With the allotted time and available resources, the entire the entire engineering team prepared both vehicles to the best of their ability. The LAAE team consisted of Ivan Wang, Darren Eng, William Cervantes, Edgar Millan, Javier Baldenebro, Michael Valdez, Jacob Baron, and Alanna Ho.

The rookie team was racing against several high schools, colleges, and even open division teams. Most of the teams have had multiple years of experience at the Electrathon race. This was the first time in nearly a decade that the program had participated in an Electrathon race. "Taking into consideration the distance traveled and the amount of time and effort that the students put into these vehicles, this particular project can be easily classified as one of the most challenging in years," stated Mr. Richter. Mr. Richter and Mr. Hess hauled Pulse and Speed Racer across the country in a trailer and arrived in Pensacola on Wednesday evening. The entire race team and parent chaperone Mrs. Eng landed safely in Pensacola on Thursday morning. For the rest of the day and most of Friday the students made last minute modifications to the vehicles and conducted test runs in the hotel parking lot. On Friday afternoon the team faced a critical obstacle when a welded piece on the left axel broke off, rendering the vehicle unable to race. All the students quickly pulled out their smartphones and began a search for a welding shop in to fix the problem. Within minutes the team found a local welder who demonstrated Southern hospitality and welded the broken piece back together at no charge. After applying their problem-solving skills, the team. vehicles for mandatory inspection. Speed Racer passed the inspection first, but missed the first practice round from 8:30 AM to 9:00 AM. Pulse passed inspection at approximately 9:20 AM, just before the Racer passed the inspection first, but missed the first practice round from 8:30 AM to 9:00 AM. Pulse passed inspection at approximately 9:20 AM, just before the second practice round started. Both drivers, Darren Eng and Alanna Ho, received about 10 minutes of practice each before the second practice round closed at 10:00 AM.

After all 14 vehicles were lined up, the green flag was dropped at 10:30 AM. Pulse, driven by Alanna Ho, started racing immediately and followed the other electric cars. Speed Racer, on the other hand, faced a start-up issue. After resetting the system, Speed Racer, driven by Darren Eng, slowly but surely began its race. Both cars ran several laps, but both cars also had their own set of problems, some of which occurred on multiple occasions. Both Pulse and Speed Racer faced an electrical malfunction at some point in the first race. Both vehicles also faced mechanical problems. The chains on both vehicles detached multiple times during the race. Half-way through the first race the axle on Pulse bent, marking its last run of the day. After the checkered flag was waved at 11:30, all the vehicles were brought in and modifications were made to Speed Racer. The team decided to focus all of its efforts on Speed Racer for the second race.

The green flag dropped for the second time at 1:30 PM, marking the start of the second race. With only one vehicle from the Los Altos Academy of Engineering on the track, the entire crew solely that occurred in the first race kept reoccurring in the second. Regardless, the Los Altos team remained persistent and continued to reattach the chain during the race. With less than ten minutes left on the clock, the race team declared Speed Racer's last lap after the chain fell apart.

Both vehicles accumulated a total of 27 laps. Though the academy did not achieve the goals they hoped to accomplish, the Emerald Coast Electrathon was a huge learning experience for the students. Next year's students will face the task of fixing the mistakes and previously unknown flaws that this year's group faced. From the experience acquired from this Electrathon, any future Los Altos Academy of Engineering team will certainly be prepared to face any challenge.

From left to right: Rudy Chavarria, Jay Chen, Don Knabe, Anthony Duarte, Dr. Barbara Nakaoka The board members proudly present a $5000 check to LAAE's efforts to race in the Emerald Coast Electrathon.

A generous $5000 donation and open house

By: Patrick Young

This year, the LAAE Public Relations was determined to fundraise $10,000 in order to prepare for the race at the Emerald Coast Electrathon in Pensacola, Florida. LAAE students Connie Pung, Patrick Young, Jacob Barron, and Airi Fukushima formed the Fundraising Committee and presented to important people, clubs, and organizations in order to ask for donations as a start for the fundraising. The clubs that were presented to were Kiwanis, Lion's Club, and Rotary Club. One of the important people was Dickie Simmons.

Dickie Simmons is a Representative for Don Knabe, the supervisor of the 4th district. He was very impressed by the group of three sophomores and one junior who had presented LAAE's efforts to race in the Emerald Coast Electrathon and wanted to help the LAAE as much as possible. After a long period of organizing the proper paperwork, Don Knabe and Dickie Simmons presented a $5,000 check to the program.

On the afternoon of April 27th, Don Knabe, along with Anthony Duarte, Jay Chen, William

Roberts, Ms. McReynolds, Mr. Hess, Mr. Harrington, Dickie Simmons, and Rudy Chavarria, came to LAAE's shop. First, they toured around the shop observing what the LAAE students had accomplished. Finishing up the tours, the group of visiting staff presented the check to the students and a group picture was taken. With the check, LAAE was $6,000 in on their goal of $10,000. There was $4,000 still needed in order to achieve the goal of racing in Pensacola, Florida and that was when the Adopt-an-Engineer fundraiser presented by Patrick Young, was put into plan.

The Adopt-An-Engineer fundraiser was a system where all members of the engineering team went out and asked family or friends to be "adopted" for funds through mail or direct contact. When a student is adopted, the adopter is sent a thank you card and biography of the adoptee.

In addition to the Fundraising Committee's efforts, an Open House was held on April 13. The LAAE Open House allowed guests to tour the upstairs work area, vehicle demonstrations, and downstairs computer lab. Long-time sponsors, supporters, as well as LAAE alumni attended. With the generous help of parent efforts, companies such as D. Gardika's Produce Co, The Melting Pot, Food4Less, Crossfit Burbank, Holland Flower Market, Progressive Produce, Professional Produce, Ralphs, Vision Produce Company, WJL Distributors, Pacific Palms Resort and Spa, and Veg-Fresh Farms provided donations of food, gift cards for the raffle, flower decorations, and money donations to LAAE. In total, LAAE was able to raise $800 during Open House.

Without the help of the Los Altos Academy of Engineering's generous sponsors and dedicated supporters, LAAE would not have the flourished so well throughout all these years. Once again, LAAE deeply appreciates all the support sponsors, students, advocates, and parents have provided for this organization.

A Word from our Adopt-an-Engineer Fundraiser Sponsors

Thank you to the following people for your generous donation and words of encouragement.

Norma Manning:
"Proud of your program."

Dickie Simmons:
"I am so proud of the outstanding quality of students produced by our high school (Los Altos High School)."

Mary Ann King:
"I wish you much success-and enjoy the journey."

Brad Manning:
"I wish you the best with the "Pulse" car in Florida good luck!"

Gino Kwok:
"Thank you for making our spirits soar through the power of imagina-tion."

Vern Moyer:
"I wish you the best of luck with your plans."

Maureen Sinclair:
"Best of luck from Educational Services, LPVROP."

Michael C. Lewis:
"Passive Aggression: Never put your foot in it, never back off (Unless you have to)!"

Sheila & Ed Richter:
"Explore the future and enjoy the journey. Engage and conquer."

Jamie Shar:
"Best of luck, Samantha."

Maggie Torres:
"Best of luck to you on this endeavor! We're so proud of you, have fun!"

Alma Banuelos:
"So proud of you! Love, Aunt Alma."

Kai & Mari Eng:
"Go Conquerors! Win the race, Darren!"

Stephanie Jao:
"Kevin, proud of you, I would like to share with your success!"

Hector Olivar:
"I am very proud of you. Love you."

Cliff & Sandy Eng:
"Do your homework. Be prepared."

Jim & Carolyn Haboian:
"Good luck with Los Altos and keep up the good work!"

Sel Zamara:
"$10 to Los Altos Academy of Engineering and a great cause."

Alan Chen:
"I really hate this 15 word limit, always "Too Limited!" Good luck for OSU, bro!"

Rick Menius:
"Good luck. I am a Los Altos graduate

A Word from our Adopt-an-Engineer Fundraiser Sponsors

Thank you to the following people for your generous donation and words of encouragement.

Robin Polito-Shuffer:
"Best of luck to you as you change the world!"

Liz Sanchez:
"Dream big Noe! We're proud of you. End-less opportunities await you. Put your mind to it and believe in yourself. Love, Sanchez Family."

W. Gilbert:
"Good luck in Florida, Kenneth Hirscht! Good luck in Florida, Ashley Ho!"

Brian & Pam Eng:
"Go Conquerors! Have fun and be safe!"

Doreen Eng:
"Good luck Darren and Kaitlyn! We're proud of you!"

Randy Hain:
"I'm an Engineer...no one adopted me..."

Lorena Eng:
"To Darren and Kaitlyn 'Engineer' Eng- Have fun!"

Clark & Renee Simonian:
"Keep up the great work!"

Vivian Hiyashi:
"Good luck to all the Engineers at Los Altos. Best wishes and much success."

Ana Alvarez:
"Very, very proud of you."

Hsinyih Su:
"All the best, Samantha! Love, Sabah's mom."

Joanna Eng:
"Happy Engineering, Darren and Kaitlyn! Good luck and drive safe Darren!"

Brenda Hernandez:
"Best of luck to Edgar and his team!"

Mrs. Piner:
"Best of luck!"

Kim Banda:
"Good luck!"

Sylvia Baldenebro:
"Go team Pulse! We are winners no matter what!"

April Ho:
"Good job!"

Bernice & Sabrina:
"We both wish you guys luck and hope everything goes well."

Emad Kalta:
"Good luck in your goals, and future in your school."

Basim Wassif:
"Good luck in Florida and enjoy this once in a lifetime opportunity."

Anne-Marie Prendiville:
"Congratulations Edgar! Good luck!"

A Word from our Adopt-an-Engineer Fundraiser Sponsors

Thank you to the following people for your generous donation and words of encouragement.

Erendira Andrade:

"Los Altos Academy of Engineering, good luck on your new project. Bring back a win!"

Leticia T. Carrillo:

"Sky is the limit! Reach for the stars! Proud of you! Wish you the best! Love, Aunt Letty, Robert, Anthony, Manny & Brenda!"

JR Terrazas:

"Good luck Noe. We know you will make us proud. God bless you."

A Word from our Adopt-an-Engineer Fundraiser Sponsors

Thank you to the following people for your generous donations and words of encouragement.

Don Knabe
Patricia McIntosh
Nikki Kodama
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Los Altos Academy of Engineering 2012-2013

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Thank you for your continuous support in the Los Altos Academy of Engineering. We deeply appreciate your participation in helping LAAE build a cleaner, more fuel efficient tomorrow.

LAAE

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