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Always Showing: Bar with links to sections below & link in upper corner for web designer Kevin

* Home
  + Function Elitist Logo (Image: FE-LOGO.PNG)
  + Name: Joel P Walta
  + Titles and Credentials: Mechanical & Material Science Engineer & Consultant

Mechatronics, Automation, Programming, Control Systems

California State Polytechnic University, Pomona

* About Me
  + Profile Picture (Image: ProfilePicCircle.JPG)
  + Brief description of me and my current status
    - Thirteen years of engineering and project management experience in designing and fabricating prototype and limited-production components for the automotive and motorcycle racing industries. Seven years of engineering experience involved with designing, manufacturing, and consulting in the aerospace and medical industries. Graduated from Cal Poly Pomona with a Bachelor of Science in Mechanical Engineering, Material Science Engineering Minor, and a focus/emphasis on Control Systems, Automation, and Mechatronics.  
      Particular experience in:  
      - Development and qualification of high energy density fusion welding processes, such as Electron Beam or Laser Beam Welding.  
      - Destructive and Non-destructive testing, metallurgical analysis, and failure analysis of weld joint design and component manufacturing/processing.  
      - Radiographic interpretation of component fit-up and welds, including real-time scanning/imagery via radiography.  
      - Dynamic systems and control engineering, stability programming, and implementation of mechatronic technology.  
      - Software development and automation solutions to streamline repetitive processes.  
      - Managing and conducting Production Engineering and R&D projects.  
      - Meeting AWS, AMS, ASME, MIL, and other engineering specifications.  
      - Certified Electron Beam Weld Operator with Electron Beam Welding LLC since 2012.  
      - Seminar/Workshop Precision Weld Presentation at Cal Poly Pomona to teach upcoming engineers about weld joint design, keeping manufacturing and cost-effectiveness in mind when designing components, and sharing experiences of dos-and-don'ts in the engineering world.
  + Link to download CV (Document: CV.pdf)
  + Link to download Resume (Document: Resume.pdf)
* Engineering & Manufacturing
  + High Energy Density, Precision Welding
    - Electron Beam Welding LLC
    - Link to <https://electronbeamweldinginc.com/>
    - Image: EBW1.jpg, Caption: Improving Weld Joint Design. Which weld joint would better suit the application? What kind of stress riser(s) are allowable to meet the requirements and stand up to stress and fatigue?
    - Image: EBW2.jpg, Caption: Metallurgical Analysis. Cross section of a weld showing penetration and grain-structure. Any cranking or porosity found? Is the HAZ too large? Is the resulting penetration within the target range?
    - Image: EBW3.jpg, Caption: Destructive and Non-Destructive Testing. Radiographic scanning allows us to find porosity or cracking inside the weld without destroying the component. Some specifications, such as AMS2681, allow for a one-time reweld attempt to remove any defects in the weld, potentially saving the component from being written off as noncompliant.
    - Image: WeldPres.jpg
      * Link to download Weld Presentation (WeldPresentation.PDF)
      * Caption: Here is a copy of the weld presentation I use to teach upcoming engineers some concepts about high energy density weld processes, what to keep in mind when designing weld configurations, and how to be a designer of cost-effective components.
  + Prototype & Limited-Production Components
    - Designs from the Function Elitist Engineering & Racing Team
      * LED Light Source Retrofit
        + Images: LEDCADAssy.jpg, LEDRealAssy1.jpg, and LEDRealAssy2.jpg
        + Caption: Customer requested a retrofit of a new light source to replace a former halogen light source, using LEDs of equal or higher intensity. A bracket that allowed for 3-Dimensional adjustment (1.5” forward and back, .25” left to right, and 1” up and down) was also requested. My team was able to reduce the cost to the customer by 40% compared to sourcing a retrofit elsewhere, provide an LED light source twice the intensity of the competitor’s solution, and provide an intensity approximately 7 times greater than the former halogen version.
      * Fuel Surge Tank
        + Images: FSTCADAssy1.jpg, FSTCADAssy2.jpg, and FSTRealAssy.jpg
        + Caption: With experience in the automotive racing industry, particularly with road racing, rally racing, and off-roading, a fuel surge tank was needed to reduce the occurrence of fuel starvation, which may cause catastrophic failure of the engine. Most fuel surge tanks are made of aluminum, a good lightweight, cost-effective solution. However, the fuel of choice is an ethanol-blended fuel, where my team determined that using stainless steel would be better than anodized aluminum because of its susceptibility to corrode with ethanol. We also needed to design a tank that allows for mounting in any orientation, not just vertically, so a baffling medium was included that allows for near horizontal orientation.
      * Vacuum Insulated Fuel Rail
        + Image: VIFRCADAssy.jpg and 280ZX.jpg
        + Caption: One of our project cars had an issue with fuel soaking an enormous amount of heat as it cycled through the fuel system. The fuel return lines were unable to completely dissipate all the heat before returning to the fuel tank, which cause the fuel to increase in temperature for as long as the engine was running. Once the temperature of the fuel increased to approximately 120-130F, the engine began suffering from detonation issues, subsequently reducing performance and reliability. If the fuel feed and return lines pass through the heated area between the front of the engine and behind the radiator, with the fuel rail passing over the engine block, how can we reduce the heat being transferred into the fuel? When a fuel is unable to reduce the combustion chamber temperature before the combustion cycle occurs, the fuel is susceptible to reach its flash point well before its intended combustion time. So, my team determined that we can route the fuel feed line from behind the engine, design and fabricate a vacuum-insulated fuel rail (VI Fuel Rail), and route the fuel return line out the front of the engine. This way, the fuel will soak significantly less heat and have less to dissipate before returning to the fuel tank. The VI Fuel Rail would be similar to a thermos, where a cavity, under vacuum, insulates the fuel from the heat emitted from the engine and radiator.
* Programming & Automation
  + AutoEBW Software Development
    - Images: AutoEBW1.jpg (screenshot of software) and AutoEBW2.jpg (screenshot of CNC program)
    - Caption: Similar to a lot of current CAD/CAM software available, this program specifically writes CNC programs for Electron and Laser Beam CNC Welding machines. Almost no CNC experience or knowledge is needed, because the user interface and terminology are more in “Layman’s Terms”. As long as one understands the fundamentals of welding, anyone should be able to write a CNC weld programs in just a few clicks. Many of the paths, indexing motions, and equations common to Linear, Plug, or Tube welds are written in the software. Simply type in the weld parameters to achieve target penetration (such as beam power, table speed, focus, slope in or out, pattern generation/rastering, etc) and choose whether the weld is a straight pass, a round path, or a tubular path. Conflict-Logic has been included in the software, so if an operator calls for two conflicting parameters or for a variable outside the machine's limitations, the software will write the CNC program using the more common method or limiting values. In addition to automatically resolving conflicts, the user will be warned that a correction had occurred. Version 1.0 is limited to the most common types of welds. An upcoming version will include flat and tube slots, flat and tube plates, and sine-wave welds over plates or tubes.
    - Embed YouTube Video of software being used and resulting motion:   
      (Embed Script)
  + CNC Precision Tracing and Welding of Tubes
    - Image: PrecisionTube1.jpg and PrecisionTube2.jpg
    - Caption: As any machinist knows, when it comes to chucking up on a component, the larger the diameter, the greater the apparent runout. When it comes to the welding process of large components, it is clear that the some CNC machines are missing a feature where precision tracing of the weld joint was absolutely needed. Otherwise, it is difficult to guarantee a reliable weld the does not miss the weld joint or does not meet the minimum penetration required. So, I was able to come up with a mathematical formula for determining runout coordinate position with respect to angular position, and, with the use of a Fanuc CNC controller and software, I was able to convert the mathematical formula to a macro calculation in the CNC program which precisely rotated and indexed the component simultaneously in order to keep the weld perfectly on the weld joint.
    - Embed Video showing no tracing vs tracing  
      (Embed Script)
  + Arduino, Raspberry Pi, Processing3
    - Black Box Data Logger
      * Images: BBDL1.jpg (picture of inside box showing wiring), BBDL2.jpg (picture of outside of box and working), and BBDL3.jpg (screenshot of csv with graphs)
      * Caption: Using a microcontroller, I created a data acquisition unit capable of reading and logging sensor data a wide range a sensors, from a simple voltage drop to interpreting sine or square wave signals. By acquiring data from vehicles used in racing competitions, one can determine if any adjustments to the vehicles result in an increase or decrease in performance.
    - Link to <https://processing.org/>
    - Link to <https://www.arduino.cc/>
    - Link to <https://www.raspberrypi.org/>
* Control System Projects
  + EBOV Project
    - Images: EBOV1.jpg (showing me and Jesse with 280zx), EBOV2.jpg (showing real-time data acquisition), and EBOV3.jpg (CAD model)
    - Caption: For the longest time, turbocharged engines in the production and racing worlds have had pressure-surge discharge valves, known as blow-off valves (BOV), operated mechanically by vacuum lines. When the engine goes into hard deceleration, also known as engine-braking, and vacuum is created that pulls on the vacuum diaphragm of the BOV to release the surge of forced-induction created by the turbocharger. With the advent of microcontrollers and higher processing power, what advantages can be seen when switching a vacuum-actuated BOV to an electronically actuated BOV? In comes the Electronic Blow-Off Valve (EBOV). By using pressure sensor data (Boost), engine speed data (RPM), throttle position data (TPS), and lateral acceleration data (G-Force), and EBOV can show improvements in the racing world by making a more responsive vehicle that is able to put power to the ground more quickly or by making a safer production vehicle for the public to use. In addition to reacting to pressure surges in the induction system and reducing them, the following improvements were discovered and proven: A more responsive race engine, better handling for racers, and reduced driver error (such as spinning out of control).
    - Embed video showing prototype being demonstrated  
      (embed script)
  + 1-Dimensional Drone Hover Mode
    - Images: Drone1.gif (Gif Hovering), Drone2.jpg (Response Time Diagram), and Drone3.jpg (Screenshot Report showing formulation of Control System)
    - Caption: With batteries becoming more powerful and compact, battery powered drones have become the latest RC craze. Because a microcontroller is an integral component of a drone, what additional features can be added where much of the input by an operator can be reduced to make easier to maneuver a drone? How do we keep unstable systems stable without human error? By formulating the control system of the drone in questions, allowing the gain values to be adjustable to suit everyone’s needs, creating a PID Controller function allows an operator to precisely maneuver a drone without all the “noise” of trying to keep it stable. In this prototype project, a target height is called for the operator and the drone itself will move to the new target height.
    - Embed YouTube video  
      <iframe width="560" height="315" src="https://www.youtube.com/embed/CWHSlHz6EMY" frameborder="0" allow="autoplay; encrypted-media" allowfullscreen></iframe>
* Accomplishments & Current Plans
  + B.S. Mechanical Engineering, Material Science Engineering Minor, Emphasis Mechatronics, Programming, and Automation
    - Image: Diploma.jpg
  + Certified Electron Beam Welding CNC Operator
    - Image: EBWCert.jpg
  + AutoEBW Software is pending the patent process with Electron Beam Welding LLC
  + EBOV Project is pending the patent process with Jesse Garcia, ME <http://www.jesseag.com/contact/>
  + California State Legislature Assembly Award. Certificate of Recognition for 2nd Place - $1000 Prize Winner in the 2010 Motorcycle Design Competition - July 2010
    - Image: CAAssyAward.jpg
  + Certified SolidWorks Associate - June 2013
    - Image: CSWA.jpg
  + Seeking the following professional credentials:
    - Project Management Professional Certification (PMP) <https://www.pmi.org/certifications/types/project-management-pmp/>
    - California State Professional Engineer License (PE) <https://ncees.org/>
  + Seeking the following personal goals:
    - Fluent in the Japanese language
    - Build a Formula 1000 track car that meets SCCA F1000 regulations for competition <https://naf1000.com/>
* Racing
  + Image: FE-LOGO-LONG.png
  + Caption: My affinity for racing began when I was a kid. I was a big fan of World Rally Championship (WRC), Formula1 (F1), and MotoGP. By the time I was a junior in high school, I went to great lengths planning out how I was going to graduate high school and college while being involved in the racing industry, and I already had a group of friends willing to help me. This became the birth of our Function Elitist Engineering & Racing Team and my ambition to become an engineer. By the time I was 19, I had purchased a 1991 Nissan 240SX where I swapped in a 2000 Nissan S15 SR20DE Autech engine (imported from Japan). I believe this Autech engine was one of only three in the United States at the time. I had a Japanese factory service manual for this engine where I frequently asked my Japanese speaking friends to translate it for me, so I may wire the engine correctly. At the same age, I began participating in road racing events at Willow Springs Raceway, Buttonwillow Raceway, and Auto Club Speedway. Since then, I have continued innovating with my team and worked with several project cars. The ultimate goal of Function Elitist is to build a F1000 race car to SCCA regulation and provide prototype and limited-production services to automotive and motorcycle industries.
  + MotoGymkhana - August 2014, 1st Place Winner of the Summer Season M-Gymkhana Motorcycle Competition. (<https://m-gymkhana.com/>)
    - Image: mgymkhanaWin.png
    - Image: mgymkhana1.jpg
    - Image: SCCARR.jpg
  + Embed two YouTube videos of racing footage
    - <iframe width="560" height="315" src="https://www.youtube.com/embed/KrEIKQZfXRs" frameborder="0" allow="autoplay; encrypted-media" allowfullscreen></iframe>
      * Caption: Autech 240SX vs 300ZX Time Attack Battle - Buttonwillow Raceway
    - <iframe width="560" height="315" src="https://www.youtube.com/embed/3feB-p70L2A" frameborder="0" allow="autoplay; encrypted-media" allowfullscreen></iframe>
      * Caption: Time Attack - S13 Autech Spec-S - Auto Club Speedway
* References
  + Caption: Here is a list of just a few directors and engineers I’ve enjoyed working.
  + Electron Beam Welding, LLC *(714) 670-9119*
    - Larry Sato – President <https://www.linkedin.com/in/larry-sato-6014ba18/>
    - Casey Dossey – Operations Mgr <https://www.linkedin.com/in/casey-dossey-82224888/>
  + Raytheon Missile Systems
    - Ralph Merino - Senior Multi-Disciplined Engineer/Director <https://www.linkedin.com/in/remerino/>
  + Keystone Engineering Company
    - Wayne Tuttle - Director of Mission Assurance, Manufacturing, and Innovation <https://www.linkedin.com/in/wayne-tuttle-a2b50ba/>
  + Blue Origin Aerospace Company
    - Brandon Wright - Propulsion Engineer <https://www.linkedin.com/in/brandon-wright-062821b/>
  + Valcor Engineering Corporation
    - Eliezer Vasquez - Mechanical & Aero Engineer<https://www.linkedin.com/in/eliezer-vasquez-869854b9/>
  + Esterline - Aerospace and Defense Company
    - Kevin Chao - Mechanical & Electronics Engineer, Programmer<https://www.linkedin.com/in/kevin-chao-eit-b98a5592/>
  + Siemens Automation Company
    - Haroldo Gourian - Mechanical & Electronics Engineer <https://www.linkedin.com/in/haroldo-gourian-48036777/>
  + Function Elitist Engineering & Racing
    - Matthew Serrano - Mechanical & Structural Engineer *(805) 279-8012*
    - Jacob Gindi - Mechanical & Site Engineer <https://www.linkedin.com/in/jacob-gindi-24a6367b/>
    - Zojer Bowers - Customer of FEER <https://www.linkedin.com/in/zojer-bowers-11837349/>
  + California State Polytechnic University, Pomona
    - Dixon Davis, MFE – Mfg Processes <https://www.linkedin.com/in/dixondavispe/>
    - Nolan Tsuchiya, PE, Ph.D – Control Systems <https://www.linkedin.com/in/nolantsuchiya/>
* Contact
  + Set up a window with the following boxes: Name, Email, Phone Number (Optional), and Comments
  + Set up a “Website Created by Kevin Chao” section with contact information