Team 6832 – Iron Reign Summary

Iron Reign has been a FIRST team, in one form or another, for eight years. In prior seasons, we have gone to South Super-Regionals and won the North Texas Inspire Award.

We often participate in outreach events. Last year, we fully renovated an old 90's RV to turn it into a mobile workshop for low income neighborhoods. We now drive the RV all over the Dallas Metroplex in order to reach kids who normally wouldn't have access to STEM programs, in hopes of inspiring them to go into STEM one day. We have also presented on the national stage in hopes of spreading our RV program to other cities. We recently travelled to the National Science Teachers' Association Convention in Florida so that we could represent our school as well as inspire educators in other areas to adopt our ideas.

We program our robot in Java, using the Android Studio IDE. We have integrated Vuforia and OpenCV to use our phone's camera for computer vision to identify the field patterns. OpenCV was an Intel computer vision technology that recently spun off into its own company, and Vuforia is a PTC-owned augmented reality library.

We use a variety of parts in our robot design. For example, in past years we have used a combination of AndyMark and Tetrix parts, using AndyMark materials for our drivetrain, and Tetrix for the rest. However, we are increasingly integrating REV parts into our design, as they let us be more flexible and pull off tougher designs. We also have switched from using the basic power distribution module to using the REV PDM and two expansion hubs.

In our engineering process, we use the Kaizen process, which means that we continually improve each individual part of our robot. We also have design competitions, in which two or more team members each create a part made to solve the same issue. When we were designing our cryptobox grabber, we started with a design competition. Evan built an arm-grab system for the cryptobox grabber, and Austin created a conveyor belt to grab cryptoboxes. Through testing, we determined that the grabbers were more efficient and reliable at picking up blocks than the conveyor belt. As well, the arm-grabber was more compact than the conveyor belt, which was unstable and unwieldy. Then, as we used the arm-grabber, we realized that it still needed work, as the grabber missed some blocks and the driver had to be extremely accurate. So, we designed a new rotating grabber, with soft spikes to hold blocks better, to grab blocks quickly and grab more than one at a time, then one with 3-D printed arms. Afterwards, we decided this wasn't efficient enough and created a new system with an octopucker design, then mounted the new gripper to a 270° conveyor so that we could move glyphs around the robot with enhanced speed.

We also utilize 3D printed parts throughout our robot. We design parts using PTC Creo, and can print parts in a variety of materials, including nylon, ABS, Filoflex, and Ninjaflex. Usually, we opt to use nylon, as it is flexible enough as not to break under stress, but is strong enough to handle our needs during the game without breaking. Printed parts on our robot enable us to create more flexible designs and circumvent issues that pop up. For example, originally, our robot's mecanum wheel would damage blocks when hitting them, so we had to design wheel guards to protect both our robot and field elements. We iterated through multiple designs, eventually settling on a u-shape that covered our wheels while not affecting mobility. Then, we changed the height until the part wouldn't cut into the mats while turning.

More specifically, we have created a personalized library of parts called REVolution for REV extrusions to turn them into driveshafts. We have had great success with these and have shared them with other teams to spread our parts. Refer to our additional handout and presentation for a more in-depth idea of what these do. This is the **best part** of all of Iron Reign's designs this season, and we think it is very useful and important.

This year has been an extremely successful year for our team as far a business goes. Normally, we receive FIRST sponsorships, and other minor sponsorships to cover tournament fees. However, this year, we have received sponsorships from a variety of sources. First, in building our RV, we received money from BigThought, a Dallas nonprofit, to run our RV, as well as money from a Dallas initiative called Dallas City of Learning. We also received a grant from Best Buy for 4 onboard 3D printers and 20+ laptops to educate on. Then, we received $3000 of REV parts, two practice fields, and a sponsorship from our school district in exchange for hosting a qualifier and running a DISD scrimmage. We also partnered with AWC to cut our side shields out of aluminum.

Our strategic + business plan is on the next page, and then our Tables of Contents follows, with exceptional posts that we would like you to read highlighted.