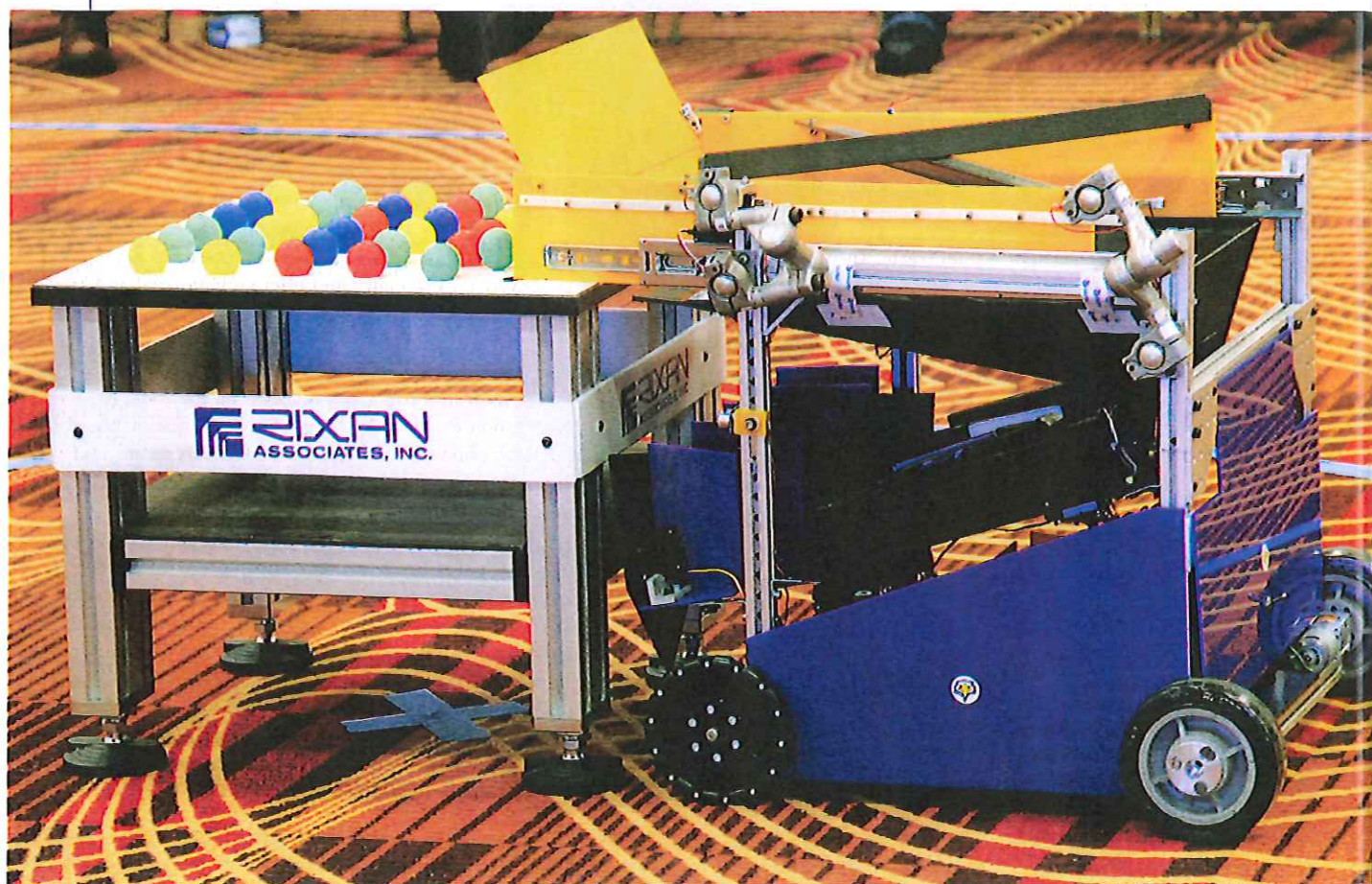


by John Robin Haughery

# ATMAE 2012

## STUDENT ROBOTICS COMPETITION



Preparing to retrieve Ping-Pong balls (MoSU, ranked 4th).

Everyone in the audience was on the edge of their seats as Jacksonville State University's robotics team driver carefully maneuvered the tele-operated robot towards the Rixan Associate's competition table. As the robot reached the autonomous zone, it continued driving towards the table on its own. Once docked at the table, it carefully collected all thirty-six randomly arranged colored Ping-Pong balls and sorted them by color with the use of an onboard color sensor and microcontroller. The audience went wild. All that



Team meeting the night before the competition.

was now left was to unload them at the designated drop off locations.

### THE TASK

Jacksonville State University's (JSU) robot was competing in the Association of Technology, Management and Applied Engineering's (ATMAE) marquee student event held November 14 - 17, 2012 in Nashville, TN. The challenge required teams to autonomously retrieve and sort thirty-six colored Ping-Pong balls before depositing them into designated receptacles located at four corners of the arena. This was a repeat of last year's com-

PHOTOS BY RICK COSCARELLI, ATMAE



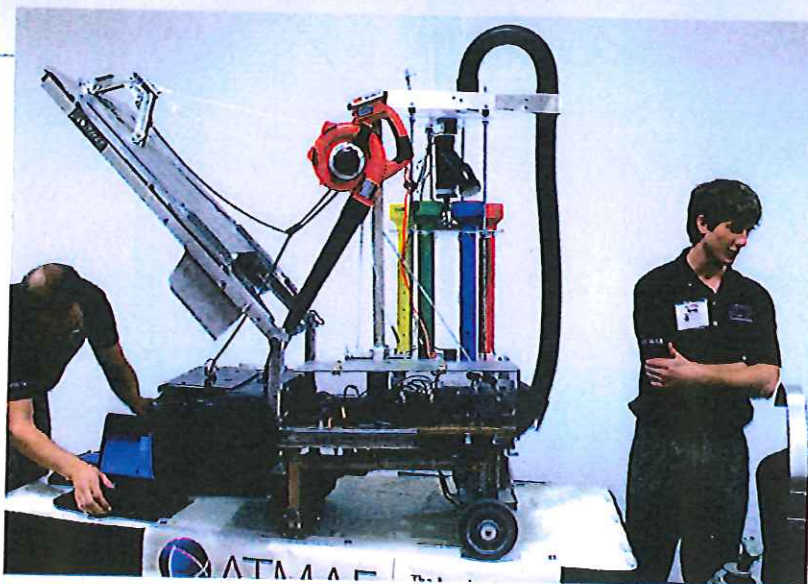


JSU's winning robotic team receiving 1<sup>st</sup> place cup.

petition. ATMAE wanted to give teams the opportunity to re-engineer and improve their designs, which is a common task in industry. Undergraduate teams from East Carolina University, Jacksonville State University, Mississippi State University, Morehead State University, North Carolina Agricultural and Technology State University, the University of North Dakota, the University of Northern Iowa and Southern Illinois University-Carbondale competed in this prestigious national robotics contest with the hopes of taking 1<sup>st</sup> place honors.

#### MAJOR CHALLENGES

During the competition, every team fervently worked to overcome game time issues ranging from power management and control system programming to mechanical design problems. All of these issues made the task of retrieving and sort-



Competition's tallest robot towering above the spectators (SIU-C).



ing all thirty-six balls exceptionally difficult.

#### ON-THE-FLY SOLUTIONS

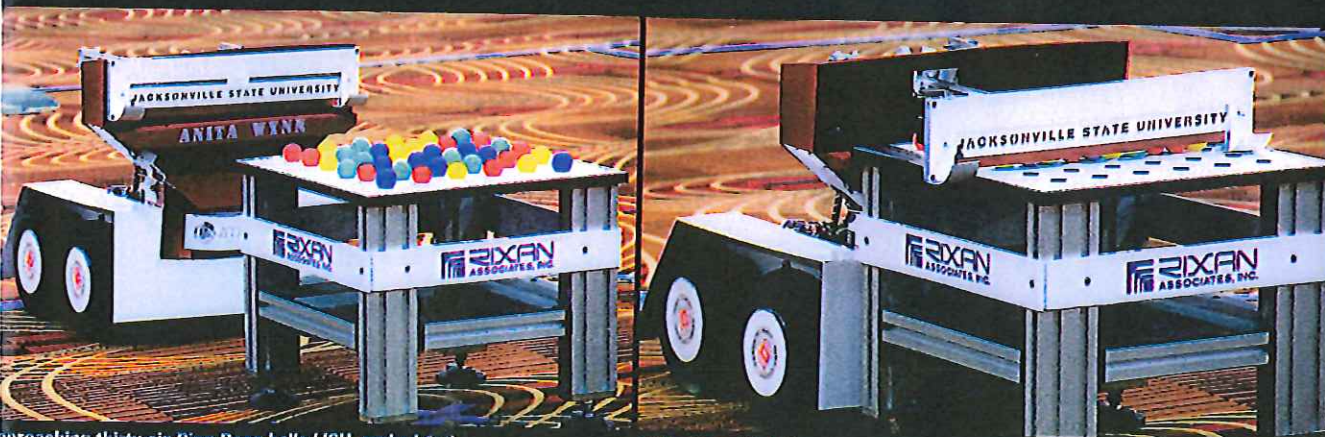
The competition's staging area looked like a NASCAR pit. After each team's run, their members hurriedly made tweaks and alterations to ensure maximum

Ping-Pong ball drop off (MoSU, ranked 2nd).

## Jacksonville State University's Winning Robot

The Student Robotics Challenge saw a wealth of innovative designs, including fuel cells, solar panel arrays and power cell capacitors. JSU stood above the rest with their seamless integration of LM298H motor drives and PIC16F690 microcontrollers. The motor drives interfaced their microcontrollers with their output motors. Programming the PIC16F690's was accomplished with MPLAB IDE v8.76 software from Microchip. These microcontrollers

were also responsible for carrying out autonomous control and decoding pulse inputs from a Spektrum DX7 transmitter/receiver for manual control. For a complete listing of all components in the winning robot, please scan the barcode or type in [find.botmag.com/031302](http://find.botmag.com/031302).



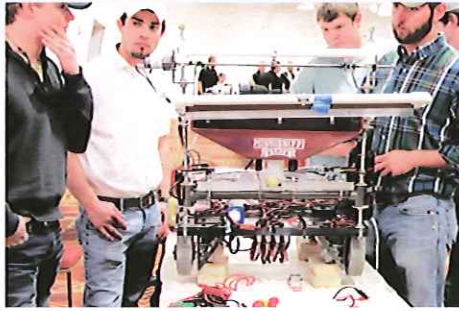
Approaching thirty-six Ping-Pong balls (JSU, ranked 1st).

Mid-retrieval (JSU).



## ATMAE 2012 STUDENT COMPETITION

performance. These mid-competition alterations spelled the difference between first and last place for some teams in this highly competitive contest. JSU, MoSU and SIU-C made some of the most noteworthy alterations. Each of these teams failed to retrieve a single ball in their first rounds but after mechanical adjustments to their robots they successfully collected all thirty-six Ping-Pong balls.



Making mid-competition alterations (MiSU, 8th).

### FINAL ROUND

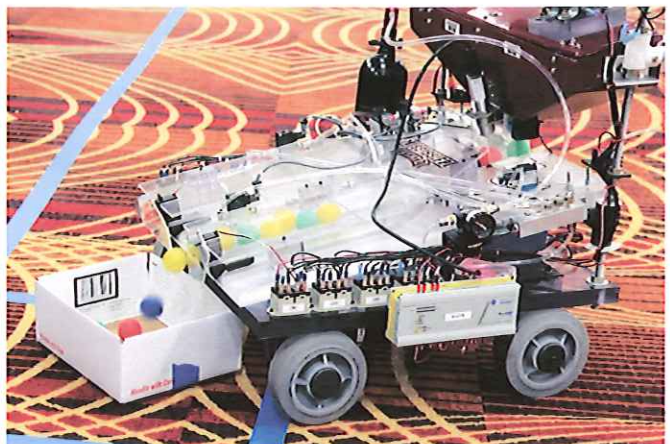
Entering the final round, it was still anyone's competition to win. Catching back up with JSU, once all thirty-six Ping-Pong balls were collected and sorted, they made a B-line for the drop off containers. At this point, JSU was the first team to successfully collect, sort, and unload all thirty-six Ping-Pong balls, giving them a perfect scoring round. The gauntlet had been laid down. As JSU anxiously sat on the sidelines, team after team failed to successfully complete the task, until SIU-C. They were the last team to run and as they scooped all thirty-six balls off of the table, everyone held their breath. They raced



Final drop off (UNI, 5th).



Preparing to collect Ping-Pong balls (NCA&T, 9th).



Dropping off unsorted Ping-Pong balls (MiSU).

their robot to the unload receptacles, but one of the balls escaped their sorting system hopper, sealing their defeat. The final overall standings at the ATMAE Student Robotics Challenge, was JSU in 1<sup>st</sup> place followed by ECU in 2<sup>nd</sup> place and UNI in 3<sup>rd</sup> place. Special thanks to Steve Harris of Rixan Associates and the listed sponsors for their support of the contest!

Author, John Haughery is a graduate student in Engineering and Technology Management at Morehead State University. He received his Bachelor of Science in Industrial Technology with a focus in Electronic/Control Systems from Millersville University in Pennsylvania in May 2006. Mr. Haughery, originally from Lancaster, PA, spent six years in industry working for Multi-Dimensional Integration where he held the position of Project Engineer. Readers may contact the author at [jrhaughery@moreheadstate.edu](mailto:jrhaughery@moreheadstate.edu) —the editors ©



### Links

Challenge Summary, <http://atmae.org/divisions/2012StudLeaderLtr.pdf>  
Contest Rules, <http://atmae.org/divisions/2012RobotRules.pdf>

For more information, please see our source guide on page 80.

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