

UNIVERSITY OF  
TORONTO

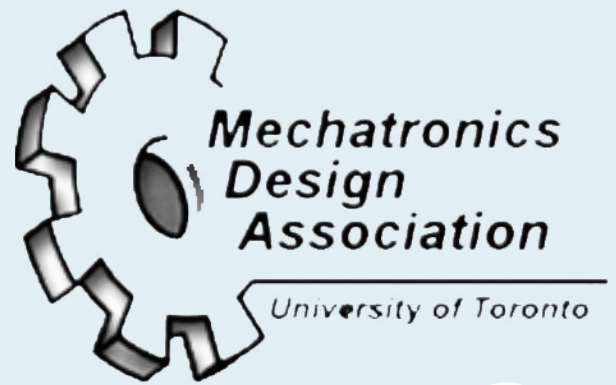
# MECHATRONICS DESIGN ASSOCIATION



## Partnership Proposal

2010-2011

# OUR MANDATE



The University of Toronto Mechatronics Design Association (UTMDA) is a multidisciplinary student organization mandated to provide design experience to all students, by developing, applying, and promoting mechatronics technology. We develop a wide range of valuable technical skills in fields, such as electrical and mechanical engineering, systems design, software development, communications, and control systems. The ultimate goal is to solve challenging design problems and promote teamwork among the student body. This is accomplished through the Autonomous Underwater Vehicle competition held annually by the Association for Unmanned Vehicle Systems International (AUVSI).



Created in 2005, the team has accomplished more tasks each year within the competition, climbing through the rankings. UTMDA brings a great deal of exposure for its sponsors. During recruiting events and competitions, a banner bearing the logos of our sponsors is put on display in front of thousands of students, community members and spectators from around the world.

With a contribution from your organization The University of Toronto Mechatronics Design Association can continue to follow your example as a winning team. With each achievement we represent you as a leading competitive force. We would be very honored and grateful if you could join us and help us achieve greater success in our endeavors.

Sincerely,

**Mark Harfouche, President**

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# THE TEAM

UTMDA is comprised of a number of specialized teams, each managing different aspects of the project. These teams include Administration, Mechanical, Electronics, and Software. They work on the various components of the project, which include Administration, External Relations, Mechanical, Communications, Control Systems, Vision Software, Power Distribution, and Sonar. Each team is multidisciplinary and may work on more than one component.



## ADMINISTRATION

The administrative team is responsible for management of team accreditations, budgets, as well as interacting with corporate partners. Members that contribute to this group tend to contribute to other groups as well.

## TECHNICAL TEAMS

### MECHANICAL

The mechanical team is responsible for designing and fabricating a waterproof enclosure to house the underwater vehicle electronics. They are also responsible for the passive grabbing mechanism, as well as the torpedoes and torpedo launcher. The constraints of the mission including size, mass and underwater environment make this a challenging task both in terms of design but also in fabrication. Members gain experience in design, material selection, modeling and fabrication.

### ELECTRICAL

The underwater vehicle centers around a modular electronics system, which interfaces the sensors and provides a friendly interface to the competition divers. Members engage in circuit design, assembly and debugging and gain strong technical skills in these fields.

### SOFTWARE

The software system for the underwater vehicle is comprised of multiple modules with various functions. This includes the software that runs on the embedded processor, as well as the vision and design making algorithms used to execute the mission. A machine vision simulator was also developed to provide a test environment for our vision system. Members gain experience in developing complex code and algorithms, as well testing and debugging the systems.

## INTERNATIONAL AUTONOMOUS UNDERWATER VEHICLE

# COMPETITION

UTMDA will be competing in the 14th Annual International Autonomous Underwater Vehicle competition.

It is hosted by the Association for Unmanned Vehicle Systems International (AUVSI), in San Diego, California, and brings together more than 30 universities and colleges from all over the world.

The competition involves the design and production of an automated underwater vehicle. The vehicle must use onboard computer, vision and navigation systems to complete various tasks without any human input.



UTMDA Team at the Competition Site, 2006



Competition Site: TRANSDEC Facility, San Deigo, CA

## THE TASKS

THE COMPETITION IS COMPRISED OF SEVERAL TASKS DESIGNED TO TEST THE VEHICLE. THESE ARE:

1. Pass through a qualification gate.
2. Find a light buoy that is moored to the floor of the test facility and knock it down.
3. Find a pipe and make the vehicle pass through it.
4. Find boxes on the floor of the pool, and drop a marker into it.
5. Find the target and fire torpedoes at it.
6. Find a sonar beacon and retrieve an object that is near the beacon and surface at that location.



# PROMOTION PLAN

In order to ensure our sponsors are well represented UTMDA devises a promotion plan with various events and advertising media that provide the greatest penetration within the student body and the community at large.

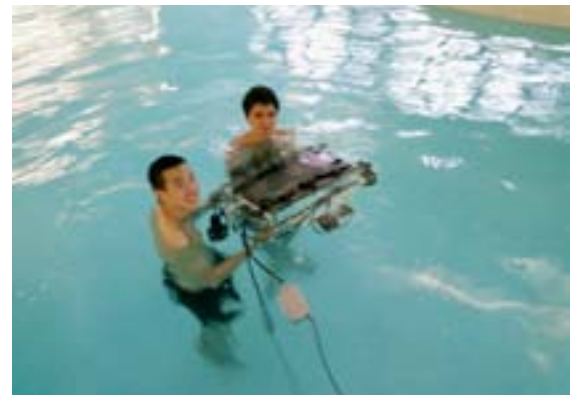
## CAMPUS EVENTS



The University of Toronto Mechatronics Design Association is committed to promoting robotics at the University of Toronto. Every year we seek to gain new members from all engineering disciplines including mechanical, industrial, electrical and computer engineers. This is done through attending club fairs during Frosh week as well as organizing a robotics competition for our new members to get working on a real project from day one. We also attend multiple student and club mixers within the engineering community such as Design Club Suds which help us continuously promote our club to prospective members.

## COMMUNITY EVENTS

Throughout the year, we also hold demo days for interest students and sponsors to see the current vehicle in action attempting to complete mock-ups of the competition tasks. These events help bring our members in contact with our university and corporate sponsors allowing our sponsors to see their contributions in action. This year, we plan to hold two demo days, one in late February, during reading week, and one in June, closer to the competition date.



At each of these events representatives from the team are present with t-shirts bearing sponsors' logos alongside a banner. Leading up to these events UTMDA posts many posters promoting the club, the events and our sponsors. We also publish a semi-annual newsletter detailing the team's accomplishments and all of our sponsors receive a technical paper of our design.

# PROPOSED APPLICATION OF SPONSOR FUNDS

Along with the joint contributions of internal and external sponsors, any form of sponsorship would be central to our teams' participation in the 2011 AUSVI Autonomous Underwater Vehicle competition. Sponsors' funds would help alleviate the costs associated with some of the following items:

- Tools / Building materials
- Competition registration fees
- Development of circuit boards
- Shipping costs (to and from the competition)
- Machining aluminum



## WHAT WE ACCOMPLISHED

Last year, with the generous contribution of our sponsors we were able to develop a new battery kit, including charger/monitor, redesign many of our existing circuitry and test our design more thoroughly. Previously many of our circuits had been made from home-grown printed circuit boards due to funding restrictions, however, this came at the cost of robustness. With the newly redesigned circuits and their professional production, we established a more reliable system that could withstand extended usage. This allowed for additional testing hours thereby improving our overall design.



## LOOKING AHEAD

This year, with granted funds we intend on continuing to log numerous testing hours to compliment the design work and guarantee flawless functionality throughout the competition.

We will also invest more money into prototyping various designs for smaller subsystems alongside increasing spending on advertisement to promote student awareness of the team as well as its sponsors.

We will build spare components in case of failure due to fatigue, as our experience in years past has taught us.

Finally, with sponsorship funds, we will machine aluminum for the body of our vehicle, which will not only provide us with a more robust design but it will allow for savings in the future due to its modular nature. With these steps forward we hope to further develop the team and rank amongst the top competitors.



Thank you for considering  
our partnership proposal.  
We hope to be in contact  
with you in the near future.

## **Mechatronics Design Association**

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