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Spotlight

Anik (L) and Shiblee (R) testing the communication system of the excavation robot

Braving all Odds with ChondroBot

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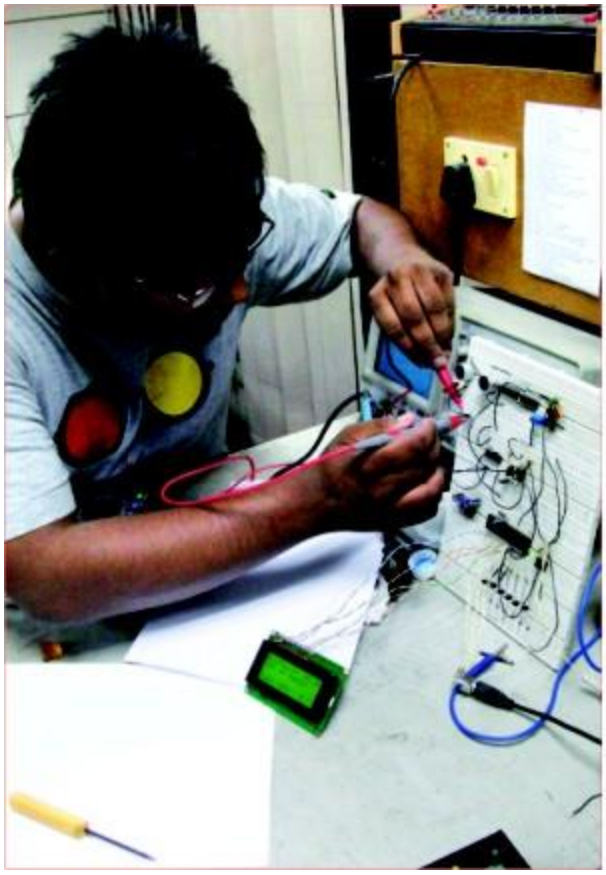
Since the moon landing, space with its wonderful mysteries became the new playground; imaginations rolled far and wide. NASA and Apollo became names that triggered dreams of wanderlust. Today, after more than four decades these names invite the same feelings of mind boggling curiosity and the impulse to beat it. Who would have thought that a group of youngsters from a country that has had no connection whatsoever with NASA and its space explorations, would have something to offer to the top astronauts and scientists in the world -- something they had never seen before. For most Bangladeshi youngsters, the idea of robots may be confined to George Lucas movies where these creations exist in far-flung places, and are almost too surreal to be true. What this Bangladeshi group of undergraduates did was creating a robot of their own and participating in NASA's Annual Lunabotics Mining Competition in Florida, making their way to the finals. Four final year students of BRAC University, including three faculty advisors

and three volunteers, the team has for sure, shown how Bangladesh is always full of surprises. This is their story.

The BRAC U team with their lunabot at the Kennedy Space Centre. Courtesy: Md Khalilur Rahman

It is not the first time that NASA had organised a programme to encourage scientific thinking among the younger generation. However, the Annual Lunabotics Mining Competition was the second of its kind, inviting international students to participate in the most unique university-level contest. The challenge was to design remote controlled or autonomous excavators, or lunabots that have to collect and deposit lunar simulant. Around 48 teams from five countries, namely, the United States, Canada, India, Bangladesh and Columbia, participated for the 2011 competition. NASA is of course, looking out for clever ideas, and upon evaluation and testing, will adopt the most innovative excavation concept for their next lunar expedition. The team from BRAC University was led by Shiblee Imtiaz Hasan from the Department of Computer Science and Engineering (CSE), who is also a member of Space Generation Advisory Council that is supported by United Nations and had previously participated in other competitions, having won awards as well. The team also had Kazi Mohammad Razin, Mahmudul Hasan Oyon, Mohammad Jonayet Hossain, from the Department of Electrical and Electronic Engineering (EEE) as well as Dr Mohammed Khalilur Rahman, Assistant Professor of the Department of CSE, who mentored and worked with the team as a member and friend, and accompanying them to the States for the final showdown. The main force to inspire the team forward, braving them up for all challenges, the teacher has been the most significant support for the entire team, as echoed by all the members. The four volunteers whose contributions, the team thinks made them indispensable, were Md Asifur Rahman, Eftakhar Karim Rahat, Imran Bin Jafar and Nirjhor Tahmidur Rouf, all students of EEE of BRAC University.



Anik testing the circuit created by Jonayet. Courtesy: BRAC U

ChondroBot after the assembly at NASA.
Courtesy: Md Khalilur Rahman

When NASA contacted the team upon approving their first step, a 3D CAD model of the robot complete with animations, and welcomed them to join the competition, the members, after a flurry of celebrations, knew better than to shout out from the rooftops. As Kazi Mohammad Razin says, "It happened almost immediately after we had submitted our designs. We had gotten through and it hit us then, the fact that we really were competing in one of the most challenging competitions! We did not want everyone to know about it just yet." Keeping amongst themselves, the team set to work from November, 2010, eventually naming their creation ChondroBot. During the months that followed till April, when the robot finally had a shape, the team spent hours at the university lab or the workshop near their university, where Monir bhai helped them with the welding, screwing and drilling. Late nights at the university became the norm. The team faced their biggest challenge as they got their hands on the hardware. Figuring out which component goes where was easy but what was daunting was finding out what was available in the market. In order to make do with the material that was available, the team had to alter their design, going through as many as seven stages of refinements. It was on their hunt for the desired components that the group came to know of the existence of Dholaikhal, the haven of all kinds of scrap. Shiblee Imtiaz Hasan recalls the regular trips that the team had to make to this place, a place that is equivalent to madness, "It was entirely up to us to navigate through the expanse of the scrap yard. It was difficult because the names that we would know for each piece

of hardware would go under a completely different name over there. The workers showed little interest and we knew we had to do the scouring by ourselves." While the foreign teams had airliners and hardware companies to come into their aid for all the material they needed, the BRAC U team had to either make them from scratch or utilise used components. Weighing 75 kilograms, ChondroBot controlled by Wi-fi was designed to travel on lunar surface and excavate and deposit lunar regolith, the fine dust such as that found on the moon. "Nothing that we used was brand new. Everything was recycled and made by ourselves, for example the circuits and the conveyor system that we fitted in," says Shiblee. Compromising on their designs with limitations like these as well as the specifications that NASA had chalked out, the team proudly announces the rickshaw bearings they used upon finding no other alternative. "See, we had the rickshaw technology going to the moon," quips Shiblee.

Team members with their teacher in front of the Mission Command Centre. Courtesy: Md Khalilur Rahman

Turns out, it was the rickshaw technology indeed that made ChondroBot stand out from the crowd. "We ended up spending only $500 whereas most of the other teams had spent as much as $10,000. The NASA scientists and astronauts who were on the judges' panel admired ours for its efficiency and its simplicity." ChondroBot was carried all the way to America by four of the team members. Instead of shipping it, the team had dismantled their robot and had re-assembled it upon reaching. The team reached the Kennedy Space Centre on May 23. Mahmudul Hasan

Oyon mentions after meeting the other teams and their creations, he had realised that the foreign teams were not as drastically different in their designs as he has imagined. “I found that we were thinking the same things, we had similar concepts.” The teams were quick to make friends. “Among the international teams, we were the best at keeping good relations with the other teams. We shared all our information and they did the same with us. Also, we let everyone know that we were here to know,” comments the team leader, Shiblee. Razin shares the surprise that the team had generated among the American audience. “There were people from the media interviewing us. Some of them went up to the NASA astronauts asking if there really was a team from Bangladesh. Once we had set up our robot, we received the loudest cheers and claps as we displayed our work, and the same happened when we went to the stage to receive the award. They were wonderfully surprised to see us come from so far and the hospitality we were shown was just great. What they loved most about our work were the recycled items we had used and the cost-effectiveness of it all.”

The team sharing the NASA experience.
Photo: Kazi Tahsin Agaz Apurbo

The day of the final and actual attempt, the remaining 25 teams were taken to an open space, a simulated environment of the moon bearing craters and boulders, and covered with the regolith. Each team had to split up, with half of the members setting up the robot on the pit, and the remaining members stationed at the command centre from where the robot would be navigated to excavate the regolith and then deposit into a specific zone. A number of teams were disqualified when their robots broke down while some failed to function. The BRAC U team split up with two members at the pit and two at the command centre that was 60 metres away. ChondroBot was designed to communicate with the laptop at the command centre via a wireless router. “We had our share of difficulties as well. Our bearings got clogged while our motor slowed down on the rough terrains, but we could successfully excavate the soil and then deposit into the bin. Thankfully, we faced no breakdown like a few other teams who had certain parts falling off their robots.”

Perhaps, it was sheer team spirit that drove the group of students and a teacher to connect to each other on a level that made seemingly unachievable things achievable, chipping away all limitations.

The fact that none of the members were from the Mechanical Engineering department and yet could devise a fully functional robot had grabbed many by surprise, “It was sometimes a problem that we did not have a mechanical department at our university that could have mentored us along; none of us were mechanical or chemical engineers but we knew it was physics and basic common sense at work,” says Shiblee. Jonayet Hossain remembers how impossible it had all seemed at the initial stages. “I kept wondering how we would pull this off, making a whole robot, when something like cars have never been made here.”

Testing the power system before the assembly. Photo Courtesy: Md Khalilur Rahman

Dr Md Khalilur Rahman, the faculty advisor for the team, comments on the team spirit, saying he had seen truly the best of everything. “Each member had his own input to offer. For me, as a co-ordinator and a teacher, everything was a challenge, starting from the funding to the mechanical aspects, and we faced them all with full resolution. Of course, the potential is all here, no doubt, but what we lack are proper research environment and easy collaborations between industries and the student body. Students should be given the chance to create, something that is hardly possible in our country.”

The team plans to join the competition again next year. ChondroBot, they say, can be used as a military robot or a rescue robot if its functions are changed accordingly, something that the team has in mind. “Right now, it is about teaching others how we did it. To the starters, I would say, be crazy and think creative,” says Shiblee who plans to make robots for other purposes with his team. So yes, ChondroBot does not end its journey here. Let's hope Bangladeshi students keep popping more surprises as they show off their spirit to the rest of the world!