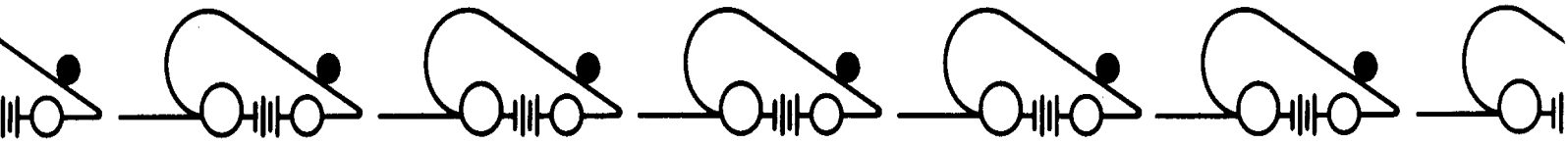

APEC 29th Annual Micromouse Contest

The goal of the contest is to design and build a robot that can navigate from the corner of a 10-foot square maze to the center in the shortest time. For most entrants the contest is divided into two phases, the search phase and the run phase. During the search phase the mouse determines at least one path from the start to the center and may seek additional paths in hopes of finding a faster one. During the run phase the mouse goes as quickly as possible from the start square in the corner of the maze to the center of the maze along the previously determined optimal path. Scoring is based on 1/30th of the time used to search the maze prior to the start of each run *(maze time),* and the time of that run *(run time).* If the mouse has not crashed or been manually restarted prior to the start of a run, a bonus of 2 seconds is subtracted from the score.

List of Contestants for APEC '15 Micromouse Contest

Mouse Name	Affiliation	Country
PicOne Turbo	Derek Hall, Jim Chidley	UK
TCVC-JL	Tianjin City Vocational College	China
Haseshumouse Ver 3.0	Shun Hasegawa	Japan
Lonng	Tianjin University	China
Kaasjager	Coen Roos	Netherlands
TSGVTC-JL	Tianjin Sino-German Vocational Technical College	China
Mach 1	U.S. Air Force Academy	United States
NU-JL	Nankai University	China
Dao-Hu	Lunghwa University of Science and Technology	Taiwan
TCU-JL	Tianjin Chengjian University	China
Big Cheese	University of Portland	United States
TDQ-Micromouse-JL/JD	Tianjin Chengjian University	China
Fab 1	Derek Hall, Jim Chidley	UK
Zeetah VI	Harjit Singh, Pierre Hollis	United States
Gale	Nankai University Binhai College	China
Decimus 4D	Peter Harrison	UK
Lighting Mequeen	Tianjin University	China
Diu-Gow	Lunghwa University of Science and Technology	Taiwan
Storm	Nankai University Binhai College	China
Siden-Kai	Masakazu Utsunomiya	Japan

PicOne Turbo is a modified PicOne Micromouse Kit. Their original concept was to promote awareness for Micromouse throughout schools and colleges with a simple to build low cost kit. It uses a Pickaxe 28x2 with 512 bytes of RAM. This is a Microchip 18 series PIC with a built in basic interpreter. It is driven by two low cost 6v motors and has three TSL262R sensors to detect the walls. It is programmed in Basic and runs without any interrupts. This year we have added a switch mode boost converter to the motor power supply to improve consistency over a wider range of battery voltage.

This year we have nine entries from six colleges and universities in China. Five of the entries are based on one of two kits developed by the Tianjin Qicheng Science & Technology Co., with R&D support from several universities in Tianjin. The names of the mice built from the kits end in JL or JD. The first parts of the names of those mice are the institution they come from. I have abbreviated the institution names in the table above. The specifications for the kit mice are shown in the table below.

Specifications	TQD- Micromouse -JL	TQD-Micromouse-JD
Dimensions	96mm ×84mm ×32mm	120mm ×90mm ×45mm
Weight	116 g	260 g
Drive Motor	1717T006S/R IE2-1024	BA6845FS
Tire size	30mm dia ×14 mm wid	45 mm dia ×8 mm wid
CPU	Cortex-M3 TI LM3S615	Cortex-M3 TI LM3S615
Wall Sensor	IRM8601S ×6	IRM8601S ×5
Top speed	5m/sec	2.8m/sec
Gyro	MPU-6050	None
Power Source	7.4V/350mAH	7.4V Lithium battery

Haseshumouse ver.3.0 was built by Shun Hasegawa from Japan. This mouse has two vacuum fans which turns in counter direction. The aim of this system is to cancel the moment of vacuum motors and stabilize mouse's posture while vacuuming. Also, I use brushless DC motors for vacuum motors in order to lower the center of gravity.

The specifications for the two mice designed and built by students from Tianjin University are shown below.

Mouse name	Lonng	Lighting Mequeen
Size	90mm x 75mm x 26mm	96mm x 78mm x 23mm
Weight	90g	96g
Wheel		23mm dia x 10mm wid
Processor	STM32F103RBT6	STM32F103RBT6
Flash/RAM	128KB	128KB/20KB
Motor	FAULHABER1524-009SR + IE2-512	FAULHABER 1717T006SR+IE2-1024
Battery	Li-ion 90mAh2S	Lithium Polymer 110mAh2S(7.4V)
Sensor	OSRAM SFH4550 x 4 TOSHIBA TPS601A x 4	SFH4550 x 4 + TPS601A x 4
Gyro	LY3200ALH(2000dps)	ADXRS620
Top Speed	2.3m/s	

Kaasjager previously participated at APEC'13 and comes with a number of modifications. The low cost motors were replaced by Faulhaber 1624T006S motors. The mechanical complexity of the operation was finally simplified by replacing everything resulting in a second edition mouse with the same look and shape. Motor mounts and a number of studs and brackets are made on a hobby 3D printer (Prusa Mendel) resulting in a total mass of 255 g. Jobs are distributed over 2 uprocessors, the motor control is managed by a PIC18FJ11 uprocessor (32MHz) and maze solving is performed by an Atmel Atmega 32 (8MHz). The relative small width of 66 mm is a benefit by passing diagonals which however remains a challenge while being supported by only one pair of 45 degrees wall sensors. A Bluetooth link is used for tracing and debugging.

Mach 1 was designed and built by students at the U.S. Air Force Academy. Their club is only one year old and this is their first contest.

Dao-Hu and Diu-Gow are designed and built by students of the Lunghwa University of Science and Technology in Taiwan.

Specifications	Dao-Hu	Diu-Gow
Length/Width	95 mm/76 mm	95 mm/79 mm
Height/Weight	21.5 mm/ 88g	21.5 mm/ 91g
Drive Motor	1717T006SR + IE2-512 x 2	1717T006SR + IE2-512 x 2
Tire size	Diameter : 22mm, Width : 9mm	Diameter : 22mm, Width : 9mm
Gear ratio	60:16	60:16
CPU	Renesas RX62T	Renesas RX62T
Flash ROM	32KB	32KB
On chip RAM	16KB	16KB
Wall Sensor	OSRAM SFH4550 x 6 TOSHIBA TPS601A x 6	OSRAM SFH4550 x 6 TOSHIBA TPS601A x 6
Gyro	Analog Devices ADXRS620	Analog Devices ADXRS620
Top/turn speed	3.8m/sec, 120cm/sec	3.8m/sec, 120cm/sec
Display	RGB	RGB
Power Source	Lithium Polymer 120mAh2S(7.4V)	Lithium Polymer 120mAh2S(7.4V)

BigCheese was designed and built by Bill Eisen Amurao, Dillon Arnold, Jason Vanderwerf, and Sophia Wuest, students at the University of Portland

FAB 1 parodies the Thunderbird's pink Rolls Royce. It uses a STM32 processor running at 72 MHZ with 96k of RAM. It has 6 TSL262R sensors and 100mAh LiPo batteries. The total weight of 100g is driven by six powered wheels, allowing the mouse to accelerate and decelerate at much higher speeds. The two centre wheels are mounted 0.5mm lower than the others, allowing uncompromised high speed cornering. It measures 115mm(L) x 75mm(W) x 22mm(H).115mm.

Zeetah VI was designed and built by Pierre Hollis and Harjit Singh. Zeetah VI implements a four wheel drive system. The mouse uses the STM32F103 microcontroller. Power comes from two LiPo 100 mAh cells. The motors are MicroMo 1717T003SR with IE-512 encoders. The mouse measures 92 mm x 74 mm and weighs 82 g.

The specifications for the two mice designed and built by students from Nankai University Binhai College are shown below.

Specifications	NanKaiBinHai Micromouse Gale No.	NanKaiBinHai Micromouse Storm No.
Size	96mm x 69mm x 23mm	90mm x 74mm x 21mm
Weight	98g	90g
Wheel	23 mm dia x 9 mm wid	25 mm dia x 8 mm wid
Processor	STM32F103	STM32F103RET6
RAM	512K	512KB
Motor	1524T009S/R IE2-512	1717T006SR+IE2K512
Gear Ratio	39:8	42:8
Battery	Li-Po(11.1V 150mAh)	Li-ion 150mAh2S(7.4V)
Pwm Freq	64k	64k
Sensor	infared light sensor	OSRAMSFH4550 TAOS TSL262R
Gyro	ADXRS610	ADXRS610
Acceleration	15m/ s^2	15m/ s^2
Turn Speed	80cm/sec	110cm/sec
Top Speed	4m/sec	4 m/sec

Decimus 4D is a classic (full size) micromouse by Peter Harrison from the UK. Using the common four-wheel drive layout, this revision has upgraded motors giving it a top speed in excess of 5m/s. The use of 3D printed parts has greatly simplified the mechanical design and construction of this mouse. Decimus 4D has demonstrated repeatable turns at more than 1.5g of centripetal acceleration and

straight-line accelerations of up to 13m/s. The ARM cortex M4 processor is an STM32F407. Running at 144MHz, it performs all the navigation, solver and control functions using floating point throughout while still only taking up less than 10% of the available processor power. Recent modifications to the sensor geometry are designed to permit turns that are smoother and faster while still constraining the centripetal acceleration. Software improvements include a new pathfinder algorithm in an attempt to find a more effective route by taking into account the mouse dynamics.

Siden-Kai was designed and built by Masakazu Utsunomiya, from Nagoya, Japan. In Japanese, "Siden" means lightning and "Kai" means improvement. I selected this name because I want this mouse to run as fast as lightning. I have applied the fan car technology to micromouse. This mouse equipped small vacuum fan in the center of the body. This fan generates down force by sucking out the air under the body. Thanks to this down force, it is possible to turn faster and increase the acceleration. Other typical point is that equipped with eight wall sensors. This aimed to have a redundancy in the detection of wall edge. For more information, please consult my website (sorry some Japanese fonts exists) http://hidejr1053.web.fc2.com/MM13.html

The maze design for this year's contest was prepared by Mr. Gerado Molina. He has designed the mazes for all the recent APEC contests. He has a "Maze Solver" app on the App Store if you are interested.