# Requirements

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Requirements for T-RHex prototype

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for Team 1, 

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R1 - System shall be able to receive commanded gaits
- R1.1 - Robot shall validate all gait position commands to be between 0 and 4096
- R1.2 - Robot shall execute a set of commanded gaits in the order it received from the instruction parser
- R1.3 - Robot shall repeat the set of commands until the robot receives a shutdown command
- R1.4 - Robot shall repeat the set of commands until the robot receives a different set of commands
- R1.5 - Robot shall validate all velocity commands to be between 0 and 1023

R2 - Robot shall communicate with servos
- R2.1 - Robot shall use the USB2Dynamixel communication protocol at 1M baud
- R2.2 - Robot shall not command a servo to a position marked by the validator as invalid
- R2.3 - Robot shall not command a servo to a velocity marked by the validator as invalid

R3 - Robot shall report its status via LED lights
- R3.1 - Robot shall display a unique light when the system is active
- R3.2 - Robot shall display a unique light when the system detects the battery is too low for safely operating the servos (within 500mV)
- R3.3 - Robot shall display a unique light when the system detects it can report its status via the networking interface

R4 - Robot shall report its status via a networking interface
- R4.1 - Robot shall report all information within 1s of receiving it
- R4.2 - Robot shall not send information without first establishing a connection with a client computer
- R4.3 - Robot shall report its knowledge of current positions of all servos
- R4.4 - Robot shall report its battery voltage, accurate to no more than 500mV
- R4.5 - Robot shall report its current draw, accurate to no more than 500mA
- R4.6 - Robot shall report its knowledge of its current orientation, accurate to no more than 0.1rad
- R4.7 - Robot shall report its current gait position command
- R4.8 - If the client computer disconnects, robot shall wait until an active connection is re-established
- R4.9 - Robot shall only send data to a single client at a time

We shall define leg positions as follows:
If the robot is lying down on its "belly", a leg position of "90" represents a leg that has its leg pointed straight up
A leg position of "0" represents legs pointed towards the "nose" of the robot
A leg position of "-90" represents legs pointed straight down. Note that this position is used for standing the robot straight upright
A leg position of "180" represents legs pointed towards the posterior of the robot
Note that the direction of the legs does NOT indicate the way the microspines nor the tips of the legs are facing, rather

the direction is represented by the vector from the fulcrum to the tip of the leg

R5 - Robot shall attempt to remain in a stable state

- R5.1 - On initialization, robot shall command all legs to the position of -90, within a margin of 5 degrees
- R5.2 - On shutdown, robot shall command all legs to the position of 90, with a margin of 5 degrees
- R5.3 - When robot receives a command to stop or change instruction sets, robot shall command all legs to the position of -90, within a margin of 5 degrees