Embodiment Alpha ver.A.1.0*

Project Codename:	Omniraptor
Alias Name:	Pegasi
Date:	Oct / 10 / 2004

*Patent granted

PEGASI™

DYNAMIC STABILITY ROVING VEHICLE

Description: The concept at hand is a departure from the convention that vehicles should maintain a stable orientation while in motion. The present design involves a pair of omnidirectional wheels rotatably connected to an axle. The result is a round profile rover which is stable longitudinally but can roll freely in the traverse direction to its axle. Each of the omnidirectional wheels has a set of peripheral toroidal wheels that impart longitudinal thrust to the vehicle. Also, each of the omnidirectional wheels can rotate as a whole (in opposite directions relative to each other) to enable steering action.

User skill: The user has direct control of the steering and thrust actions via a remote control unit. The rover will exhibit a natural tendency for incidental rolling (careening) due to inertia, or surface incline. As a result navigation becomes a challenge and the operator's skill (ingenuity, coordination, reflexes and physical intuition) is deliberately put to a test, where the user is called to combine the direct steering and thrust actions in a strategic way that compensates for the indirect careening (rolling) effect while at the same time causes the vehicle to move on the desired path of motion.

Handling comparison: The overall handling behavior of the Pegasi rover is expected to liken that of a hovercraft with the exception that (given enough skill) the Pegasi is capable of more precise control, with sharp changes of direction and can actually climb uphill.

PEGASI - RADIO CONTROLLED ROUND PROFILE DYNAMIC STABILITY ROVING VEHICLE

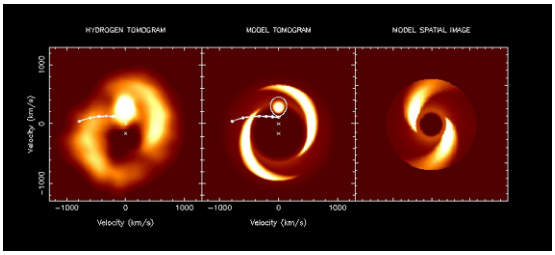
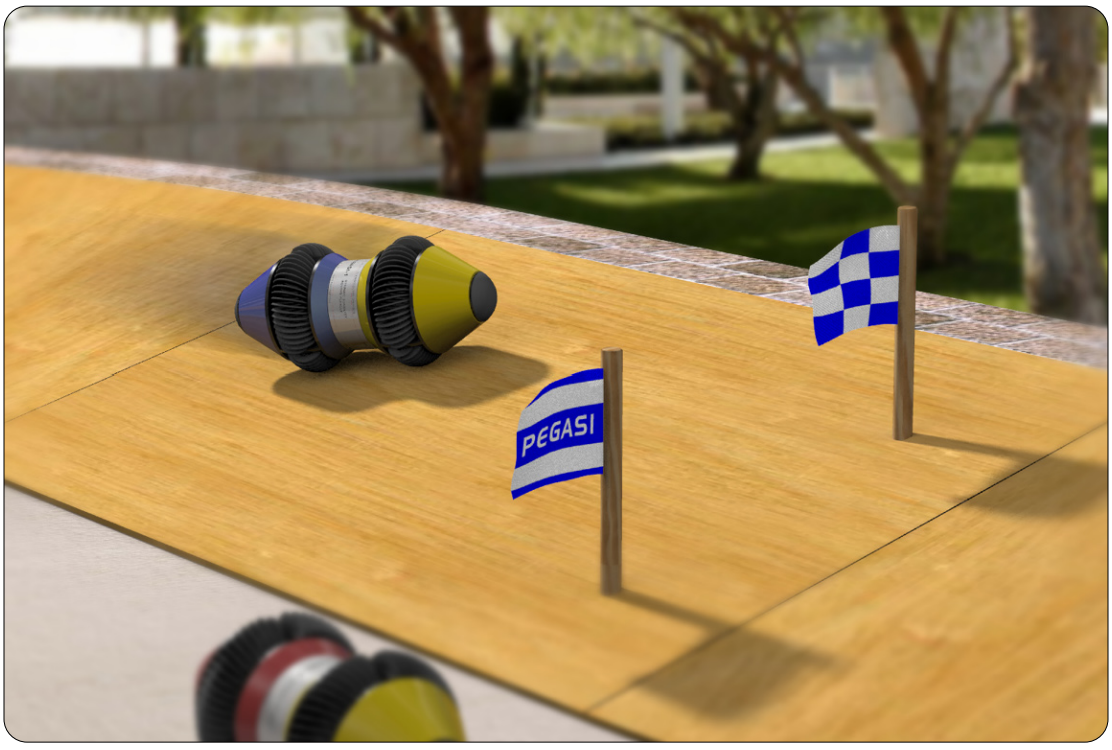


Image Credit: D. Steeghs, E. Harlaftis, K. Horne, Astronomy Group, Univ. St.Andrews

IP Pegasi, is a binary star system in the constellation of Pegasus, where gaseous matter ignites brightly as it flows from the system's K5 secondary star to its white dwarf while both stars orbit each other.



PEGASI ROVER ENVISIONED IN MOTION ON A SKILL-TESTING TRACK DURING A TOURNAMENT EVENT

Stability: The Pegasi rover is also equipped with onboard electronics receiving feedback from orientation sensors. In the event that the user requires assistance in stopping the vehicle and presses an emergency stop button (on the remote controller) then the onboard computer will engage into an autopilot mode and utilize feedback from the orientation sensors to bring the vehicle to a stop in the shortest possible time; using an optimum set of automated deceleration (zigzagging or spiraling) maneuvers.

Application: Each end of the Pegasi rover is color coded in a vivid contrasting manner so as to give the operator a visual reference from a distance. Tournaments can be arranged as a way for people to meet and present their skill and mastery of control. The events can be timed and involve goals arranged on special skill-testing tracks featuring a combination of destabilizing factors such as abrupt turns, successive inclines of various degree, slalom-type sections and similar balance intensive challenges.

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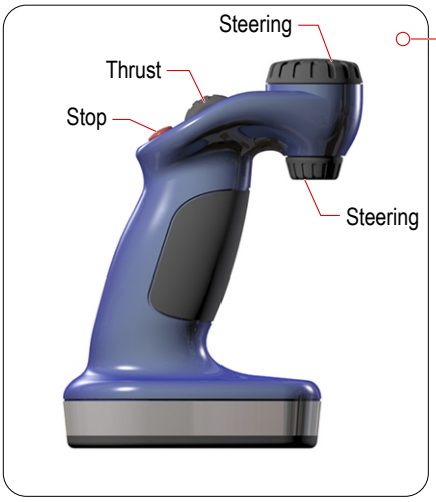
PEGASI™ DYNAMIC STABILITY ROVING VEHICLE

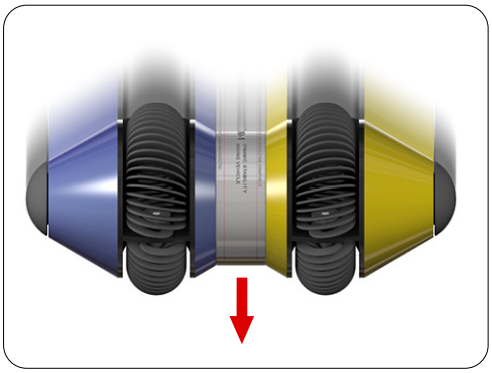


REMOTE CONTROLLER - SIDE VIEW

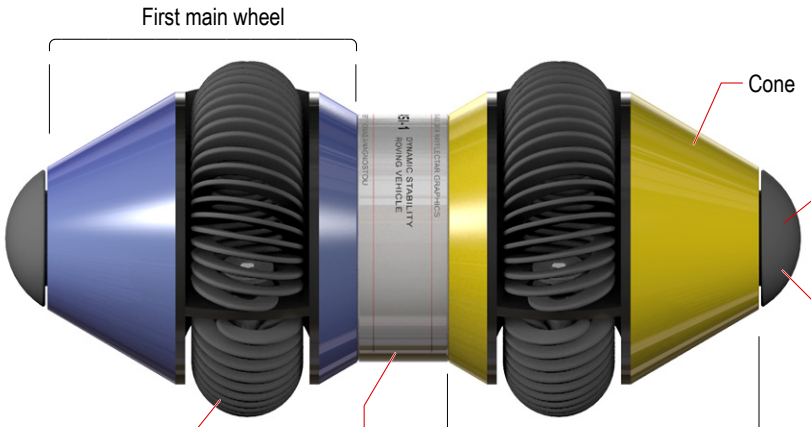
The Pegasi rover can move in three ways:
a) Direct control of forward / rear thrust, in response to thrust signals from the remote controller.
b) Direct control of turning, in response to steering signals from the remote controller.
c) Involuntary rolling, in response to inertia or surface morphology.

The user's skill is put to a test in attempting to use the direct control methods (a) and (b) for navigating the Pegasi to a desired course / path while at the same time compensating for incidental rolling (c).

A2 → When the emergency stop button is pressed, then the onboard computer takes over (autopilot mode), and uses feedback form orientation and azimuth sensors, to bring the rover to a dynamic stop in an optimum (shortest possible) distance; using a minimum number of automated deceleration maneuvers.

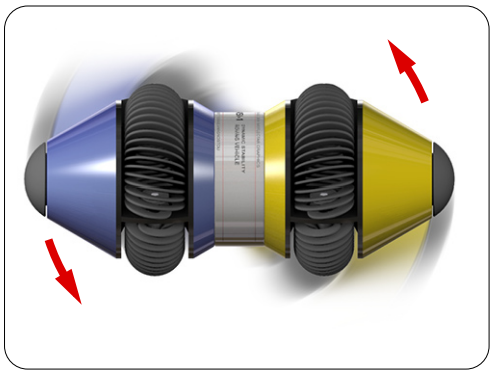


ROLLING ACTION



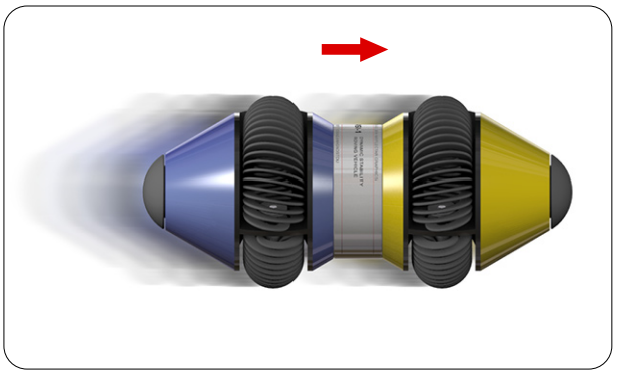
A1 → The domed cap forms the tip of a cone, on the side of each wheel, and prevents the Pegasi rover from accidentally balancing on the vertical.

The Pegasi rover has multiple axes of symmetry (thus orientation agnostic) which unlike a car or motorcycle, cannot become stranded by standing on its side (or upside down); its wheels are always in contact with the ground.



STEERING / TURNING ACTION

The overall behavior of the Pegasi rover can be likened to a hovercraft, with the exception that the Pegasi can make sharp changes of direction and can actually climb uphill.



FORWARD THRUST ACTION

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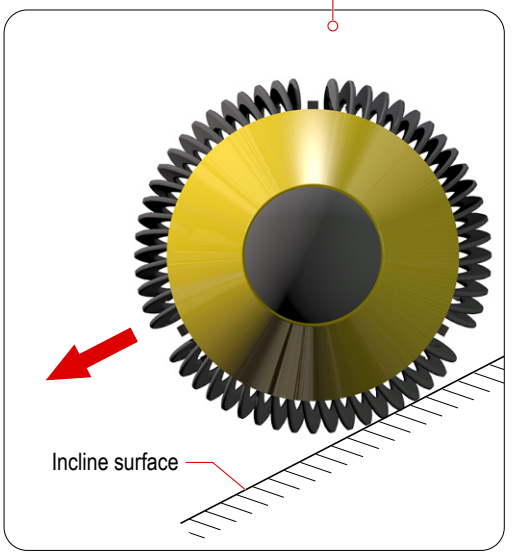
Thrust occurs when the peripheral wheels rotate synchronously in the same direction.

Steering occurs when the omnidirectional wheels rotate in opposite directions relative to each other.

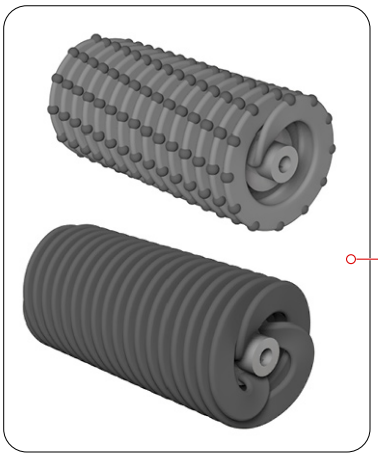
The rover will roll freely downhill due to its round profile. The user may allow it to happen deliberately (as for example to conserve power) or may choose to compensate and maintain control by judicious use of thrust and steering actions.

First omnidirectional wheel

Second omnidirectional wheel



PROFILE VIEW - ROLLING ACTION

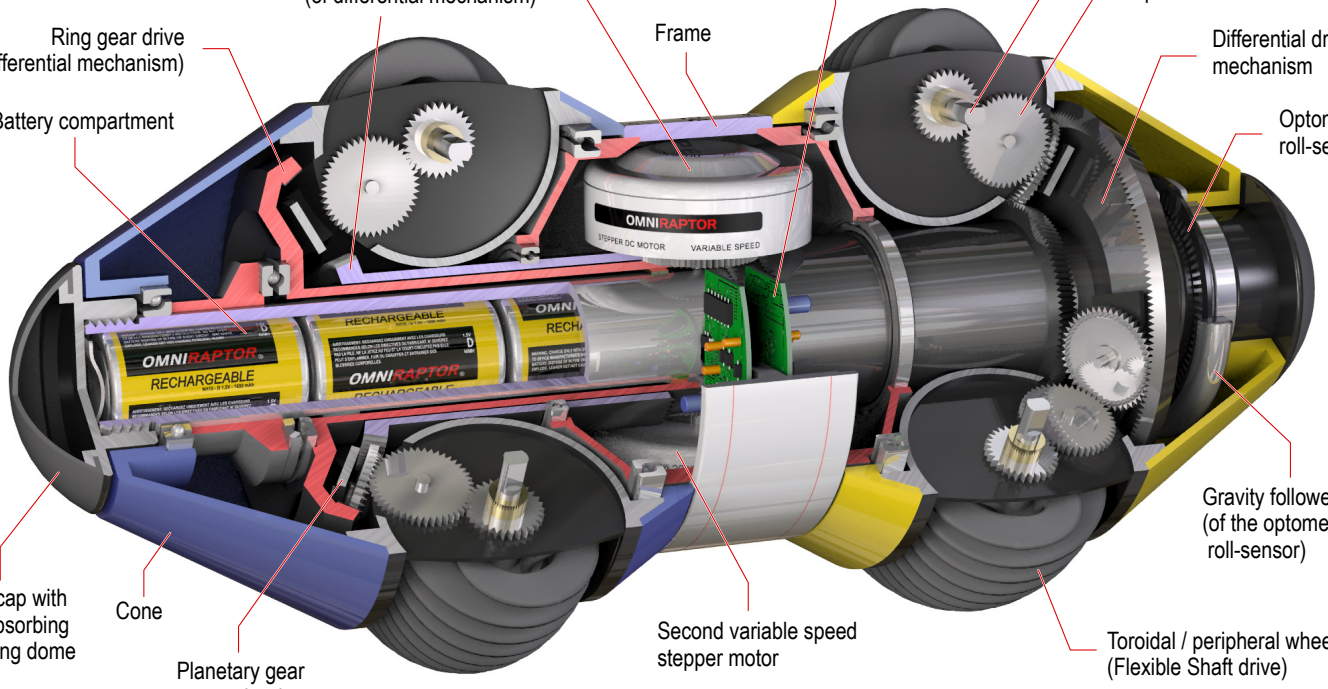


PERIPHERAL WHEELS

Toroidal / peripheral wheels are detachable (for replacement or cleaning) and interchangeable for a variety of treads and traction characteristics.

The peripheral wheels have sufficient stiffness so that they do not deflect under the weight of the vehicle, or under normal driving conditions.

Each of the wheels of the Pegasi rover have surfaces of vivid coloring (contrasting relative to each other) so as to provide a visual reference to the operator form a distance.



First variable speed stepper motor

Electronic processing unit (PCB with integrated orientation and azimuth sensors)

Spindle

Spindle Transmission

Sun gear drive (of differential mechanism)

Ring gear drive (of differential mechanism)

Frame

Differential drive mechanism

Battery compartment

Optomechanical roll-sensor

Battery cap with bump-absorbing cushioning dome

Cone

Planetary gear carrier ring

Second variable speed stepper motor

Gravity follower weight (of the optomechanical roll-sensor)

Toroidal / peripheral wheel (Flexible Shaft drive)

First omnidirectional wheel

Second omnidirectional wheel

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