Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

BULLETIN
BUL-028

Rapid Install Overview

Kairos Autonomi has started an internal development project to re-package a Pronto4 Series4 (P4S4) into a system that can be installed in an unmodified vehicle in less than 30 minutes. The final goal of this install project is a 10 minute install.
The system is expected to be fully functional for both Tele-op and Path following operations.

The markets for this include training, construction and potential tactical usage.
With a drastically reduced install time, the vehicle does not need to be prepared and the footprint of the kit is small. The skill of the installer is reduced and installers and operators would almost always be the same individuals.

The system is still man operable even when the Rapid Install kit has been installed. Manual human operation over top of a Pronto4 Rapid Install is not as comfortable as you are sitting on top of the robot.

The project was broken into two prototype parts, both running concurrently. A functional prototype and a pre-production prototype

Functional Prototype

> A simple adapter for an existing P4S4 that places the P4S4 in the seat and uses existing motion means. It is not expected that a human operator would be able to co-exist with the functional prototype. This will allow testing of motion concepts such as steering, throttle, brake, etc without the focus on P4S4 functionality and modifications.

Pre-Production Prototype

> Much closer to the final configuration of the product. All primary features and design goals are attempted and met. Most of the effort on this prototype will be mechanical until nearly all mechanical goals are met. When the mechanical design and production flux as reduced, PCBs from the P4S4 will be adapted.

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

BULLETIN
BUL-028

Spiral Development with Technology Vectors

The Pronto4 Uomo (P4U) prototypes now exist. They were developed using proven existing technologies from the Pronto4 Series 4 (P4S4). In addition to all the features currently encompassed in the P4S3, the P4S4 will see a number of technologies further developed to achieve enhanced capabilities as desired by the market. The process of repackaging existing technologies provides a firm ground for each of the technology vectors that will see migration as the P4S4 development moves forward. The design of the P4S4 is as orthogonal as possible with its components migrating into other areas of Kairos unmanned systems
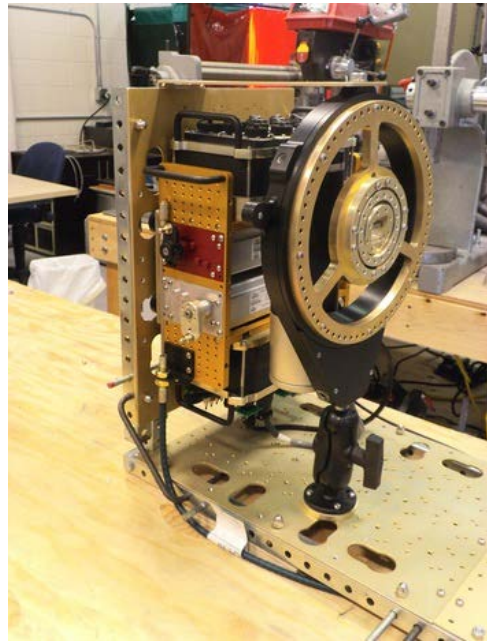
Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

**BULLETIN
BUL-028**

A simple adapter for an existing P4S4 that places the P4S4 in the seat and uses existing motion means. It is not expected that a human operator would be able to co-exist with the functional prototype. This will allow testing of motion concepts such as steering, throttle, brake, etc without the focus on P4S4 functionality and modifications.

These are images of the functional prototype as it sits on a bench. The majority of the key features are present.

The functional prototype uses all standard P4S4 equipment except for the pull cable attachments

P4S4 Mounts to back plate using standard quick mount feet. Steering ring is positioned where appropriate for alignment to vehicle steering wheel. Standard RAM mounts are used to provide bias to steering wheel.
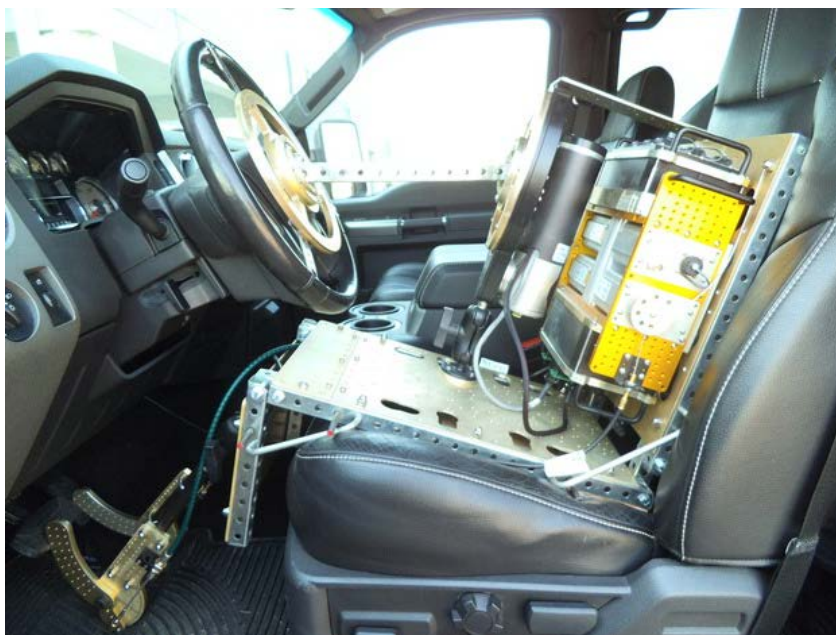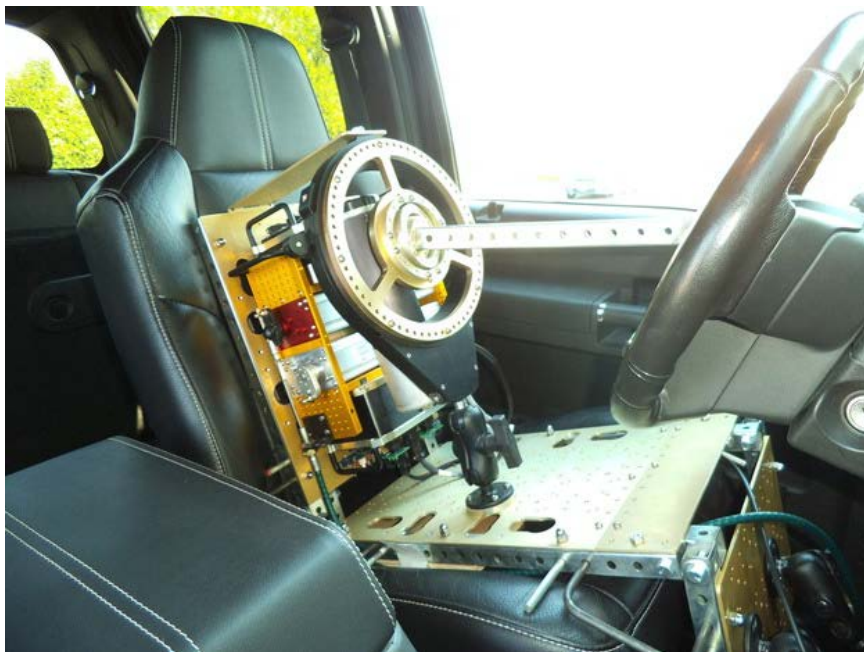
These feet are non-biased and manually adjusted for fit to pedals. Pull cable are used for actuation. The foot is spring return.

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

**BULLETIN
BUL-028**

This is a test

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

BULLETIN
BUL-028

Simplified feet using pull cable for actuation

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

**BULLETIN
BUL-028**

Note the high angle between the seat and the steering wheel.

View from over the rear driver seat

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

**BULLETIN
BUL-028**

Pre-Production Prototype

This is close similar to what the final product will look like. It is shown in its folded state. The legs are somewhat brute force approach and will migrate to a more foldable design with locking adjustments with increased rigidity.
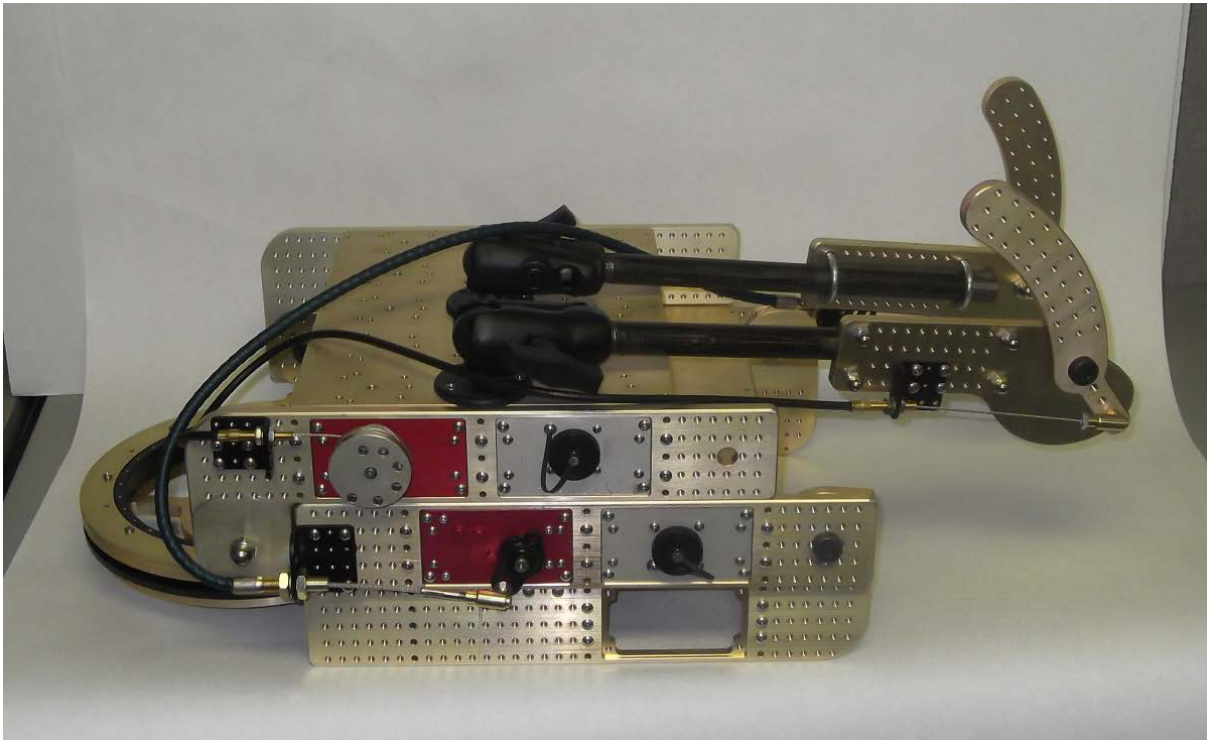
Although compact, the system unfolds into a full sized sitting humanoid robot.

Utility modules from the P4S4 and the architecture of the P4S4 are maintained for easy software migration.

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

**BULLETIN
BUL-028**
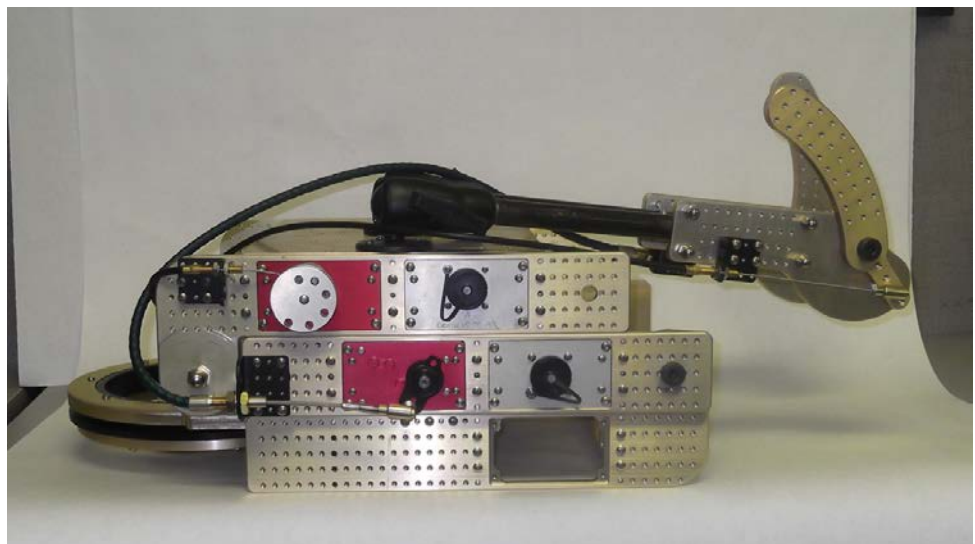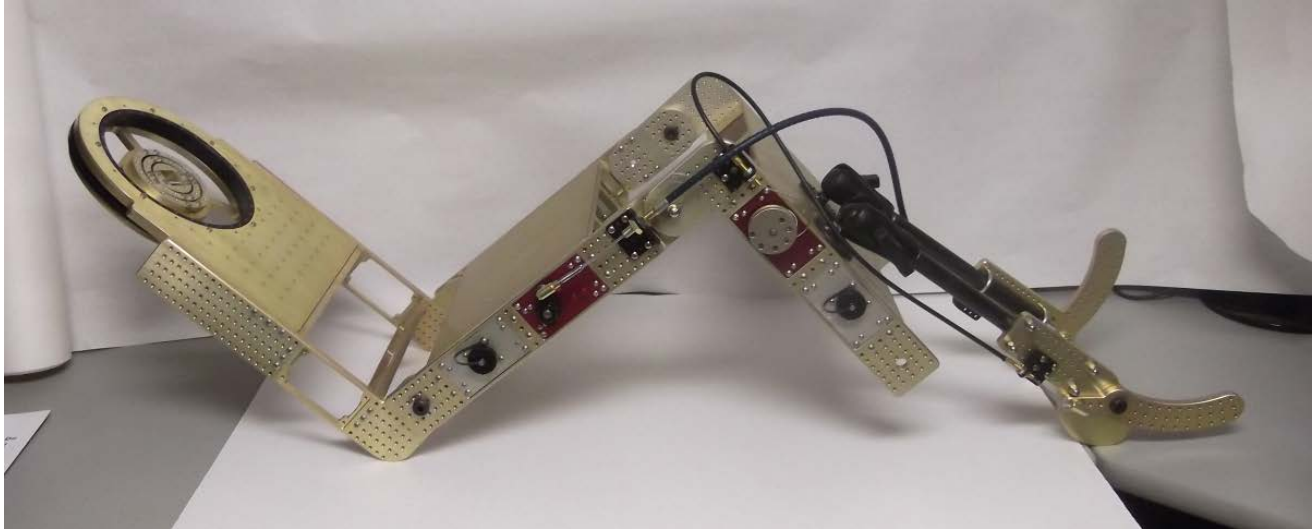
When unfolded the Pronto4Uomo has the ability to sit in the seat where a man operates a vehicle and perform similar operations.

Foot pedals and steering wheel operations are initially handled as shown.

Elements such as starting with a key and shifting are initially handled more traditionally but ultimately will see flexible arms for usage.

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

**BULLETIN
BUL-028**

Seated in the drivers seat of an F350, all primary vehicle operations are easily within reach of the Pronto4Uomo. It can be seen that a man could easily sit on top of the P4U and operate the vehicle, although uncomfortable.

Note the steering pole between the back steering means and the steering wheel.
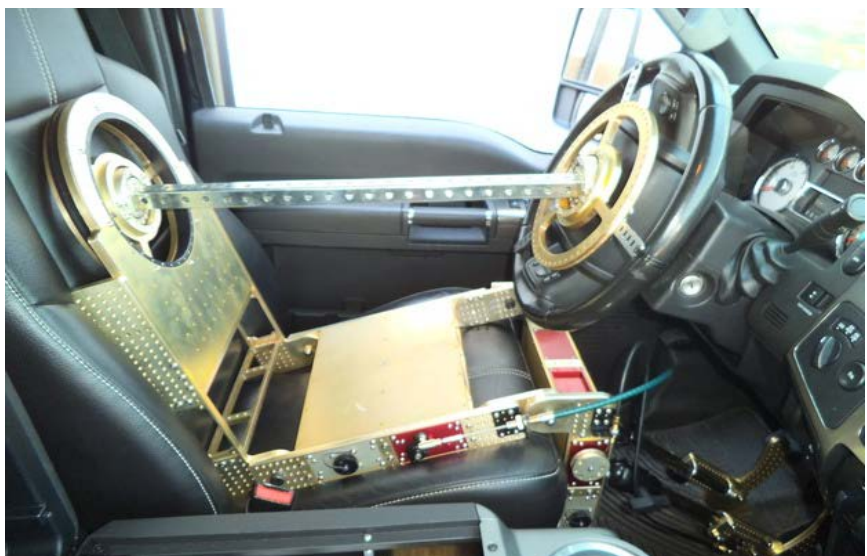
Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

The steering means has a high angle gimble that accepts a 1 inch square tube. The steering system if flat against the seat. It has the same motor and connections as the original P4S4.

A receiving gimble is tied to the steering when using the same attachments used on the P4S4.

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

**BULLETIN
BUL-028**

Look at that comfy seat. The P4U easily accommodates a human operator on the

system as the steering pole is removed to make room for an operator. The feet are either moved out of the way, or the human operator just places one foot between them.

Standard P4S4 Motors and I/O module are plugged into the body making the system very flexible for the desired mission

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

BULLETIN
BUL-028

The pedals are operated by feet. The complexity of the foot is directy proportional to the cost of its production. It is expected that several generations of feet will be developed before one is selected.

A survey was performed a large number of vehicles to determine some of the measurements that were used for the creation of the functional and pre-production prototypes.

Vehicle Dimension Survey   8-Jul-13
Version 1.00.00

Make	Model	Year	Seat Position				Seat Dimensions			
			Max Fwd to Brake		Max Rear to Brake		Front Edge to Back	Front Edge Height Min	Edge Height	Width of Seat
			Back	Edge	Back	Edge				
Chevy	Colorado	2012	36.00	16.50	42.00	22.50	19.00	10.00	10.00	20.50
Chevy	Avalanche	2004	37.00	16.00	41.00	19.75	21.00	12.50	15.00	22.00
Ford	F150	2013	40.00	19.50	43.50	23.00	19.50	14.50	14.50	21.00
Hummer	H1	1995	36.00	15.00	42.00	22.00	19.00	14.50	16.00	19.00
Kubota	Diesel 4x4	2007	37.00	18.00	37.00	18.00	17.00	18.00	18.00	19.00
Crown	30SCTF Forklift		35.00	18.00	39.00	23.00	15.00	18.00	18.00	18.50
Mitsubishi	Montero	1995	35.00	13.50	40.50	20.00	20.00	13.50	14.50	20.50
Nissan	Frontier	1993	37.50	19.00	40.00	21.00	18.50	10.00	10.00	22.00
Jeep	Grand Cherokee	1996	32.00	12.00	40.00	20.00	20.00	13.00	13.00	20.00
Toyota	FJ Cruiser	2010	35.00	14.00	44.00	23.00	19.50	11.00	11.00	20.00
Subaru	Outback		35.00	14.00	42.00	22.00	20.00	10.00	10.00	20.00
Chevy	Trailblazer	2004	35.00	12.00	43.00	20.50	21.00	13.50	13.50	22.00
Mazda	Protégé5	2003	35.00	14.00	41.00	21.00	20.00	10.00	10.00	20.00
Toyota	Celara	2005	33.00	13.00	43.00	22.00	20.00	9.50	9.50	20.00
Average Measurement			35.61	15.32	41.29	21.27	19.25	12.71	13.07	20.32

Design Goals

> Optionally Manned Operation
> Use existing Software
> Use existing P4S4 Vehicle components
>> Utility Module
>> Steering Approach
>> Mechanical Attachments
> Powered from 'cigarette lighter'
> P4S4 Hardware architecture
> Light weight
> All in one unit
> 30 Minute Install Initial, 10 minute final
> All actuators to be 'set and forget' calibration

Kairos Autonomi
498 W. 8360 S.
Sandy, Utah 84070
801-255-2950 (office)
801-907-7870 (fax)
www.kairosautonomi.com

Questions

- Is the steering pole a quick disconnect?

- If the robot feet are not moved does it pose a potential safety issue for the human driver in terms of access to the pedals?

- What about the possibility of some type of thin cushion on top of the P4U to make it a more comfy seat?

- Are we thinking of alternate casing materials to assist with weight reduction?