DIGISAD: Digital Saddle for Semi-automatic Control of Service Animals and Partially Reinstating the Animal-drawn Economy

Zisopoulos Athanasios, Gerakis George
University of Crete, TEI of Crete
Department of Mathematics, Department of Business Administration
zisopoulos.athanasios.dim@gmail.com, gerakisgr@gmail.com

Abstract
The main idea of the application is to use a modified saddle as a platform for primitive transportation applications. The digital saddle functionality approach is the combination of a perfect transportation machine like a donkey, with the intelligence of a tele-computing system. There are three basic systems to provide the fundamental digital saddle operability: a digital saddle, an animal operation center and the animal training. The digital saddle for mules, camels, or donkeys enhances semiautomatic animal guidance with a central tele computing device, that it pulls or releases reins, it energizes the reins emulation electric or palm sting, it activates the breeching strap, and it uses a battery and energy management system along with various additional facilities.
As a result, the donkey follows the generic direction to walk, without the millions of instruction needed for a robot, only with his own embedded by God into his brain "how to implement walk" logic.

Keywords: Animal driven economy, Unmanned vehicles, Semi-automatic guidance, Alternative tourism.

JEL classifications
O30=Technological Change; Research and Development; Intellectual Property Rights: General
O31=Innovation and Invention: Processes and Incentives L83=Sports; Gambling; Restaurants; Recreation; Tourism
O32=Management of Technological Innovation and R&D
O34=Intellectual Property and Intellectual Capital
L83=Sports; Gambling; Restaurants; Recreation; Tourism

Introduction to Science and Engineering

I Invention technical field areas are:

- Animal driven economy. (Perna, 2014)
- Unmanned vehicles.
- Semi-automatic guidance.
- Alternative tourism.

Two generations ago animal driven economy for transportation has been replaced by machines of all kind. However, automobiles brought new dimensions on human life. However they do suffer from a serious disordering like (Abel Bibi, 2013, Fisher,2012):

- Very primitive design.
- High cost of development and use
- The need a very intensive network for maintenance.
- Very high environment cost in consumption and noise.

An animal (donkey, camel or mule) is still the perfect transportation machine made by God and not unlimited human imperfections. (Gonzalez, 2016)

The main idea of the invention is to use a modified saddle as a platform for primitive transportation applications.

Donkeys for thousands of years are operated automatically brew, feed, orientate, walk and all other animal functions. To reinstate the donkey and mule usage we introduce the term semi-automatic (Fearnhead 2012). That means that the animal performs his mission like before but the rider is only an intelligent digital saddle and associated machinery.

In our automated world an un-crewed vehicle or unmanned vehicle is a vehicle without a person on board (Kohara,1991). Un-crewed vehicles can either be remote controlled or remote guided vehicles, or they can be autonomous vehicles which are capable of sensing their environment and navigating on their own (Shiue,2010).

Current business and technology overestimate the automobile use as high tech approach. On the contrary mules and donkeys proven to be the perfect transportation machine, having benefits like:

Full automatic orientation, path-trail following, feeding, energy consumption, extent lifetime, almost automatic operation.

Generally, the invention is based in a modified saddle to be installed on an animal that will be used for intelligence transportation.

Special attention will be given to the bio-ethics in accordance to animal treatment (Wenzel, 1991). Mules, donkeys and camels are not treated historically very well but this is not an excuse for the digital saddle to continue this. The digital saddle imitates the traditional animal guidance habits. There is no injury or any other effect in the animal.

There are three basic systems to provide the fundamental digital saddle operability:

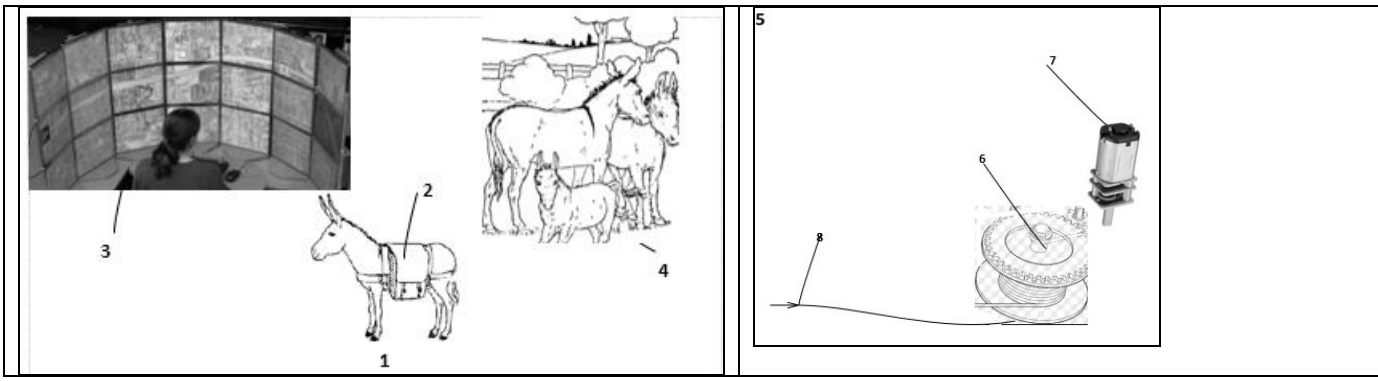
1. Basic on animal digital saddle
2. Professional animal operation centre
3. Initial animal training and retraining facilities

Drawings and Functionality

To describe the invention, we attach 4 drawings.
Drawing number 1, describes the conceptual operation schema and field application of the invention. There are four cooperating items:

- The animal (donkey, camel or mule) (1)
- Basic on animal digital saddle (2)
- Professional animal operation centre (3)
- Initial animal training and retraining facilities (4)

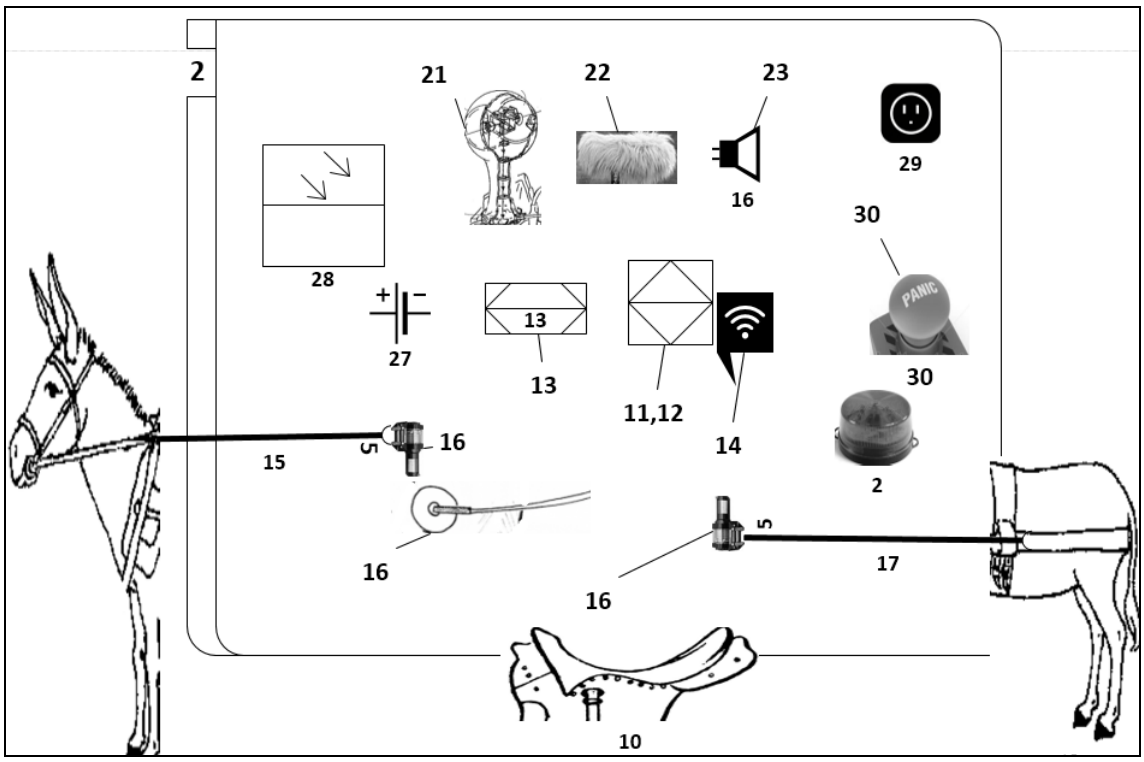
Table 1 overview, Table 2, mechanism



Drawing number 2 describes the custom made system to fold and unfold the traditional rider driven animal ropes with parts:

- Rope fold servo-electro-mechanic External box mounted on the saddle (5) housing a
- Winch type cylinder (6)
- Driven by an electric motor (7)
- That folds and unfolds the reins or breeching strap (8)

Table 3: basic invention schema



Drawing number 3 describes the basic invention description of digital saddle (2) with constituting parts:

- A basic animal saddle (10) Usual on top and side backs with space for systems and loading area.
- Computer (11) with specialized local and on host software (12)(Yelland,2015)
- They both drive an electric Switch box (13)

- and connected with a simple custom or market telecommunication system (14).
- A left rein (15) to change the Horizontal azimuth animal traveling direction implemented with type (5) rope folding mechanism. (Accordingly, there is an associated right rein not shown here)
- The optional left reins emulation electric or palm sting device (16) driven by the central computer (11) to replace left rein rope totally.
- breeching strap (17) driven by a type (5) servo-electro-mechanic, only in one side located at the left primarily for Emergency rear animal legs deterioration.
- 360 degrees' panoramic view camera (21)
- Field space microphone (22)
- Speakers left (23) right
- Strobe light left (25) and right with night green-red use.
- Battery and energy management system (27)
- Photovoltaic panel (28) to load the batteries and docking station external charger (29).
- Panic large hand operated red button for on-site emergency (30).

Drawing number 4 describes the digital saddle subsystems connection.
- The electric supply lines (32) are connected to electric Switch box (13).
- The data lines (31) are connected to the central computer (11).

The digital saddle functionality approach is the combination of a perfect transportation machine like a donkey, with the intelligence (12) of a telecom system (11,14).

Application Example

Due the complexity and ongoing development of the digital saddle as an interoperated system there are hundreds of subsystem sequences activation for different assignments. Only an example will clarify the usage, apparently only one usage of the many possible.

The example takes place in a Cretan seaside village where automobiles are not allowed to enter. Only animals, animal driven vehicles and bicycles are welcome. A donkey (1) with the digital saddle (2) chucks peacefully Silybum marianum at the village sidewalk. Suddenly a delivery truck is approaching the village to deliver beer bottles. The driver sends an SMS to the operation centre (3). The operation headquarters (3) process automatically the request and the following action is taken (Marques,2015):

- It finds the 15 donkeys closest at the delivery area closest to the village national road parking lot.
- It calculates one route plan for each donkey (Maekawa, 2013).
- The route is transmitted to the donkey telecom receiver (14)
- The operation centre evolvement stops here. (Cummings, 2103)

The donkey computer (11,12) reads the instructions and translates them into actions like:
- It sends unfold signal to switch box (13), to rotate the winch (6,7) for both left and right reins (15).
- Or it sends sting signal to the electric or palm sting device left (16) and right.
- Release a little the breeching strap (17).

With all these the donkey stops eating and start walking. After this initial wakeup and for every donkey step the system does the following:

- Calculates through GPS the actual animal position in correspondence with the arrival station.
- Translates the map follow route to left right reins (15) or palm sting device (16) actualizations.

As a result, the donkey follows the generic direction to walk, without the millions of instruction needed for a robot. He uses only his own embedded into his brain "how to implement walk" logic (Zeng,2015) (Cevallo, 2015).

The procedure is repeated at every donkey stop until the donkey arrives at the loading area. The computer finds that GPS donkey location data are identical to loading area map data and it acts:

- It sends fold signal to switch box (13), to rotate the winch (6,7) for both left and right reins (15).
- Or it sends relax sting to the electric or palm sting device left (16) and right.
- Fastens the breeching strap (17).
- Releases the hooks to the donkey canister saddle.

Then the truck driver reads in his telecom device the delivery and loading schedule and reloads the beer crates from the truck to the donkey hooks and he fasten them securely. Every donkey normally goes to different tavern, therefore a typical loading through SMS schedule would be like this.

1 Donkey number 331 will be loaded with 3 black beers 5 liter barrels, and 12 normal lite beer crates.
2 Donkey number 701 will be loaded with 12 normal 5 litre barrels, and 10 normal beer crates"

And so on.

Finally, the truck driver sends an "OK" SMS to the operational centre (2). The operator starts the reverse delivery procedure advised by the computer by pressing a single key. Then every on top of every donkey computer advices or forces the donkey to follow the map directions until final delivery to the seaside tavern.

Business and non-military applications

The above is only a simplified approach for the semi-automatic guidance. The actual digital saddle is ready for hundreds of others uses like:

- Connection to an animal drawn vehicle for passenger or heavy loads. (ambulance, taxi or other utility van)
- Every donkey is ordered to withdraw from the system and return for the night next to his owner.
- In panic situation the headquarter blocks the donkey by sending the halting signal to the breeching strap (17). This could be done at the donkey area by pressing the Panic large hand operated red button (30).

- The on animal camera delivers security blurred images but in a security incident the law permits surveillance.
- The speakers could transfer to the donkey a familiar voice (owner-trainer) recorded message automatically when donkey refuses to obey system commandments.
- A tourist oral question to the donkey goes through microphone (22), computer (11,12,13), operational centre (3) personnel (Jacobs 2013, Aksin, 1991). The operator speaks out the answer delivered back online to the donkey speakers (23).

Any animal in order to reach the desired functionality has to be trained in the training centre (4). There the mule or donkey is converted from a traditional mule into the digital semiautomatic mule of the future.

There are four animal training "character level" types:

1 Existing Untrained Animal (mule, camel or donkey) with reins.
2 Partially trained animal with reins and digital saddle incapable for operational assignments.
3 Partially trained animal without reins guided through epidermis palm or electric stings.
4 Types 2 and 3 are converted to fully trained animal capable for productive assignments within operational centre commandment.

For example, a new born foal is advised to proceed directly to third training without reins.

Most the electric and mechanic parts are commercially available from the industry today. For this reason, it is avoided a detailed material and part description.

References

A Aksin, Z., Armony, M. and Mehrotra, V., 2007. The modern call center: A multi-disciplinary perspective on operations management research.Production and Operations Management, 16(6), pp.665-688.

Bibi, F., Ali, Z., Qaisrani, S.N., Shelly, S.Y. and Andleeb, S., 2013. Biodiversity and its use at taunsa barrage wildlife sanctuary, Pakistan. Journal of Animal and Plant Sciences, 23(1), pp.174-181.

Cevallos, C., Zarka, D., Hoellinger, T., Leroy, A., Dan, B. and Cheron, G., 2015. Oscillations in the human brain during walking execution, imagination and observation. Neuropsychologia, 79, pp.223-232.

Cummings, M.L., Mastracchio, C., Thornburg, K.M. and Mkrtchyan, A., 2013. Boredom and distraction in multiple unmanned vehicle supervisory control. Interacting with Computers, p.iws011.

Fearnhead, P. and Prangle, D., 2012. Constructing summary statistics for approximate Bayesian computation: semi-automatic approximate Bayesian computation. Journal of the Royal Statistical Society: Series B (Statistical Methodology), 74(3), pp.419-474.

Fisher, M.C., Henk, D.A., Briggs, C.J., Brownstein, J.S., Madoff, L.C., McCraw, S.L. and Gurr, S.J., 2012. Emerging fungal threats to animal, plant and ecosystem health. Nature, 484(7393), pp.186-194.

Gonzalez, L.F., Montes, G.A., Puig, E., Johnson, S., Mengersen, K. and Gaston, K.J., 2016. Unmanned Aerial Vehicles (UAVs) and Artificial Intelligence Revolutionizing Wildlife Monitoring and Conservation. Sensors, 16(1), p.97.

Jacobs, F.R. and Chase, R.B., 2013. Operations and supply chain management. McGraw-Hill Education.

Kohara, I., Kabushiki Kaisha Toyoda Jidoshokki Seisakusho, 1991. Travel control device for unmanned vehicle. U.S. Patent 5,036,935.

Maekawa, T., Noda, T., Tamura, S. and Ozaki, T., Komatsu Ltd. and Yokohama National University, 2013. Travel route generating method for unmanned vehicle. U.S. Patent 8,386,110.

Marques, E.R., Ribeiro, M., Pinto, J., Sousa, J.B. and Martins, F., 2015, April. NVL: a coordination language for unmanned vehicle networks. In Proceedings of the 30th Annual ACM Symposium on Applied Computing (pp. 331-334). ACM

Perna, A. and Latty, T., 2014. Animal transportation networks. Journal of The Royal Society Interface, 11(100), p.20140334.

Shiue, Y.C. and Chang, C.C., 2010, May. Forecasting Unmanned Vehicle Technologies: Use of Patent Map. In Computer Research and Development, 2010 Second International Conference on (pp. 752-755). IEEE.

Wenzel, G.W., 1991. Animal rights, human rights: Ecology, economy and ideology in the Canadian Arctic. University of Toronto Press

Yelland, B.S., Logan, G.E. and Riseborough, P., Bae Systems Australia, 2015. Control computer for an unmanned vehicle. U.S. Patent 9,199,725.

Zeng, T., Touzni, A., Tzeng, T.R. and Bostley, P.J., Qualcomm Incorporated, 2015. Methods and systems for reducing the amount of time and computing resources that are required to perform a hardware table walk (HWTW). U.S. Patent 9,015,400.