Rail in Islands is an Expected Failure

Yair Wiseman
Computer Science Department
Bar-Ilan University
Ramat-Gan 52900, Israel
wiseman@cs.biu.ac.il

Abstract

Isolated regions do not have right and proper advantageous motives for railways construction. Therefore, isolated territories like islands will have no economic justification for railway systems. Railway systems can only achieve an economic viability in a substantial territory where there can be a need to convey a large number of people in one means of transportation.

Keywords: Rails, Islands, Autonomous Vehicles, Transportation Means.

1. Introduction

Isolated non-large countries do not have good reasons for construction of railways. In a non-isolated country even if the country is very small, a railway system can connect the county to its neighbor countries. E.g. Monaco's size is only 2.2 km^2 and even though Monaco has a railway system that connects Monaco to French and other countries in Europe [1].

There are also some Islands very adjacent to the mainland like Long Island in New York, USA, Sicily in Italy or Hainan in China. In such island the railways are usually connected via bridges, tunnels or ferries to the mainland and they can actually be considered as an undivided portion of the mainland.

On the other hand, isolated territories like islands even if their size is larger than Monaco's size, there will be no economic viability for a railway system. Railway system can only succeed in a large territory where there is a necessity to convey a large number of people as will be explained in this paper.

2. Cases of Island without Active Railways

Cyprus is an island that is surrounded by the Mediterranean Sea from all its sides. Therefore, there is no railway system in Cyprus. As a matter of fact, there was a railway of 122 km in Cyprus, but since it was unprofitable, it was closed in 1951 and currently no railway system exists in Cyprus [2].

There are still railway remnants in some locations in Cyprus. E.g. the Abandoned Railway Crossing Lights shown in Figure 1.

Figure   1.
Abandoned Railway Crossing Lights in Cyprus

Republic of Trinidad and Tobago has a similar railway history to Cyprus. There was a railway of 173 km in The Republic of Trinidad and Tobago, but since it was unprofitable just as Cyprus railway system was, the railway system of this republic was closed in 1968 and currently no railway system exists in The Republic of Trinidad and Tobago [3].

Crete railways have been shut down even earlier. Although there have never been a train passenger in Crete, an industrial railway focusing in the aim of construction the harbor in Iraklion was constructed in 1922. However, when the harbor's construction was over, the train was pointless and unprofitable, so in 1937, the train was closed and

since then, there is no train in Crete [4]. An old and inoperative locomotive dumped in a field in Crete can be seen in Figure 2.

Figure 2. An old and inoperative locomotive in Crete

A similar story to Crete was in Negros Island in the Philippines that has never had a passenger railway. Negros Island is a large sugar producer and exporter. Actually, sugar is the largest industry in Negros Island and the railway was constructed to transport freights of sugar.

In 1985, the price of sugar in the international market crashed. Most of the sugar factories in Negros Island went bankrupt and there was no good reason to keep on the railway, so it has been closed and currently there is no sugar railway in Negros Island, nor any other kind of railways [5].

Like the fail of the railways in the Philippines, the railways in Jamaica were an unsuccessful business as well. The railway system of Jamaica was opened in 1845 and this system was the first system outside Europe and North America. The British government built railways in many of its colonies and Jamaica was the second British Colony to have a railway system. Actually, the railway system of Jamaica was built only twenty years after the British government started to build railway system in the United Kingdom itself [6].

The railway system of Jamaica was on and off for more than a century until its closure in 2012. Sometimes the railway system was opened only for freight like bananas or bauxite, whereas sometimes the railway system was opened for passengers. There were also times the railway system was opened for both freight and passengers. In each of these opening, the trains were loss-making, so the railway system went out of business. In point of fact, any attempt to revive the railway system followed by insolvency [7]. A defunct train station with some defunct rolling stock in Jamaica is shown in Figure 3.

Figure 3. Defunct train station in Jamaica

Another railway system in a British Colony was built by the British government in the island of Salsette. This island is nowadays under India sovereignty; however, the railway system was already shut by the British governor in order to make way for an airport [8].

The airport was for military flights, but when India gained independence, the government of India decided to convert the airport to a civilian airport and to keep the railway closed. Although the rails in India mainland are prevalent, the government did not believe that a railway in this island is capable to be cost-effective, so until this day, there is no railway in the island of Salsette.

Not only in British colonies were railroads built, but also in German colonies. During the time of German sovereignty in the island of New Guinea, many railways had been built in the German part of the island.

At the beginning of the 20th century, Germany has decided to give a boost to New Guinea's economy by building a railroad system. The railroads were an extensive failure. Some dozens of million German Marks were invested with little return. In the First World War Germany lost its part in the island of New Guinea to Australia. The Australians did not want to go on with this unproductive rail project, so the railroads fell into poor condition. In the other parts of the island there has never been a railroad system, so as a result, nowadays there is no active railroad in the entire island of Papua New Guinea [9].

3. Cases of Islands with Unsuccessful Rail Systems

Ireland is a country within an island in the north east Atlantic Ocean. Even though Ireland is isolated, the government owns a lengthy railway system of 1,200 miles. The Irish railway infrastructure is poorly developed and ineffectively functions [10]. In addition, the Irish railways have the lowest rail electrification rate in the EU (2.7% in 2016).

In contrast to the poor railway infrastructure, the subsidy for the railway company is high-priced. USD $887 million are annually paid to the Irish rail company - Iarnród Éireann by the Irish government as a subsidy. However, only 1.7 billion passenger-kilometers are travelled annually in Ireland, that is to say the subsidy cost is USD $0.52 for each passenger-kilometers [11].

Even when comparing this subsidy price tag to China which provides an excessive subsidy to its rail system, the numbers are thought-provoking. China annually subsidies its sizeable rail systems with USD $128 billion and the train usage of China's rail system is 1,160.48 billion passenger-kilometers, that is to say the subsidy cost is USD $0.11.

China economy leans towards planned economy and heavily intervention in the market, whereas Ireland leans towards free market. Nevertheless, Ireland rail subsidy is significantly higher.

Another territory with unsuccessful rail system is Puerto Rico. Puerto Rico is an unincorporated territory of the United States located in an island in the Caribbean Sea. There is an unsuccessful train in Puerto Rico called "Tren Urbano". The train consists of 16 stations operating on only 10.7 miles all owned by the Government of Puerto Rico.

Puerto Rico's Highways and Transportation Authority who manages this train, complains on a regular basis on finance difficulties of this train and declares that as a matter of fact the train is completely running at a loss. The trains are averagely 90.43% empty [12]. Figure 4 shows a train with only single passenger within a carriage of Tren Urbano.

Figure 4. Almost empty carriage of Tren Urbano

The expected ridership of a minimum of 115,000 passengers per day [13] seems to be absolutely overstated when in 2018 the average weekday Daily ridership was only 18,600 passengers [14].

In a hearing before the Subcommittee on Regulatory Reform, Commercial and Antitrust Law, The Puerto Rico's Highways and Transportation Authority gave this disapproving statement: "There are rising operating subsidy requirements to the Tren Urbano light rail, an underperforming and underutilized asset, which has long been a burden on the overall system. Recent reports also indicate that the system has stopped paying third-party vendors amid mounting cash flow pressures." [15]. Therefore, the future of this railway is unclear.

4. Unsuccessfulness of Rail Systems

The information given above is gathered in Table 1. The statistic in this table indicates that the potential of railway system to succeed in an island is improbable. Only in large territories where there is a necessity to convey a large number of people, a rail system can be effective.

Name	Population (million)	Sovereignty	Area (square miles)	Does railway exist?	Profitability
Salsette	15.1	India	239	No	NA
New Guinea	12.6	Papua New Guinea, Indonesia	303,381	No	NA
Irland	6.8	Ireland, United Kingdom	32,595	Yes	No
Negros	4.5	The Philippines	5,048	No	NA
Puerto Rico	3.5	United States	3,500	Yes	No
Jamaica	3	Jamaica	4,320	No	NA
Cyprus	1.5	Cyprus, Turkey	3,565	No	NA
Trinidad	1.4	Trinidad and Tobago	1,934	No	NA
Crete	0.63	Greece	3,220	No	NA

Table 1. Practicability of rail systems in Islands

In the US, only the Amtrak routes in the northeast region which is the densest region in the US are moneymaking [16]. In the northeast region (Massachusetts, Connecticut, New Hampshire, Maine, Rhode Island, Vermont, New York, Pennsylvania, New Jersey, Virginia, Maryland, West Virginia, Delaware, District of Columbia) live 74,035,662 people [17] and the region is connected to the rest of the US and to Canada, so this is the opposite set of circumstances of an island. All the other routes of Amtrak run at a loss, even some of the routes within the northeast region like Amtrak's Hartford Line from New Haven to Springfield.

5. Autonomous Vehicles Renounce the Need for Rail Systems

In [18] the authors provide evidences that public buses in the near future will remain economically competitive only in dense and large urban areas. Rails have separated and dedicated pathways, so their construction costs are higher and moreover they endeavor to stop near more passengers' destinations, so all the more rails will not be economically competitive [19].

Furthermore, drivers do dot drive the same way. They take turns differently. They also accelerate and apply the brakes in their own way. This different way of driving is

the reason for almost all the traffic jams and traffic congestions as was explained in various researches [20,21].

In contrast, autonomous vehicles of even competing companies fulfill the driving assignments almost in the same way. Moreover, they can drive in a platoon [22] which means all the vehicles on the road will go like a long train keeping the same distance from the vehicle ahead and also the same speed [23]. Such a platoon can be seen in Figure 5.

Figure 5. Platoon of cars.

When such platoons are the everyday site in the roads, the railroads will be of no use, because a train takes many passengers from one central station to another central station; whereas an autonomous car can take each passenger from a different location and give him a ride to anywhere a road is present which is a much better service than a train can offer [24,25].

6. A Country in an Island-Like Location - Israel

Even though Israel is part of the Middle East, Israel is in fact an island. Israel is surrounded by the Mediterranean Sea and Arab countries – Lebanon, Syria, Jordan and the Egypt. Lebanon and Syria are enemy countries of Israel and from time to time there are even armed conflicts between countries. Jordan and Egypt are not formally considered as enemy countries of Israel, but the commute is sparse. Only in the Hajj which is an annual Islamic pilgrimage to Mecca in Saudi Arabia, many Israeli Muslims residents travel from Israel to Saudi Arabia via Jordan and the border crossings between Israel and Jordan are getting busy. At present, there is no train from Israel to any adjacent country.

The trains in Israel run at a massive loss and therefore Israel Railways is subsidized by an enormous ratio of 85% [26]. While there are occasionally overloaded trains, most of the routes are commonly unfilled and actually in average they are 70% empty [27]. Even with these openhanded conditions, the trains in Israel serve only 5% of the travels [26].

In Israel, the expansion of road no. 1 to Jerusalem from 2 to 3 lanes has been carried out concurrently to the construction of the adjacent new railroad to Jerusalem. The expansion cost of road no. 1 was NIS 2.35 billion [28] and 133,000 vehicles averagely travel on this road every day; whereas the construction cost of the adjacent railroad is estimated between NIS 6.9 billion to NIS 9 billion [29] and 9,300 passengers averagely travel in this train every day [30]. The rate of car occupancy in Israel is 1.24 to 1.34 of only private cars [31]. 133,000 of all kinds of vehicles including buses are about 200,000 people, which give unreasonable relative amount. The 9,300 train passengers are a small portion of the passengers and the investment in railroad is out of all proportion.

6. Conclusions

Rails were invented more than 200 years ago [32]. The model of rail systems is conveying many passengers from one central station to another central station. In islands such a model cannot economically do well. As was reviewed in this paper of various rail systems in islands in a variety of locations in the world, no rail system can be successful, nor can it be profitable.

In the coming years autonomous vehicles will be prevalent and these vehicle will travel in platoons which means keeping invariable distance from the vehicle ahead. These platoons will be similar to trains, but with the ability to take each passenger to his destination rather than to a central station For that reason, people will prefer to go in autonomous vehicles and there will be no financial justification for rail systems anymore [33].

The looming technology of autonomous vehicles along with the current unsuccessfully and ineffectively functioning of the rail systems in islands should discourage the transportation authorities of islands from investing in rail systems in their territories.

7. References

[1] L. Codeca, and J. Härri, "Monaco SUMO Traffic (MoST) Scenario: A 3D Mobility Scenario for Cooperative ITS", In SUMO2018, SUMO User Conference, Simulating Autonomous and Intermodal Transport Systems, (2018).
[2] B. S. Turner, "The Story of the Cyprus Government Railway", Mechanical Engineering Publications, (1979).
[3] B. Brereton, "Our railway history", Daily Express – Trinidad Express Newspapers, (2018), Available online at: https://trinidadexpress.com/opinion/columnists/our-railway-history/article_cde2e038-48f9-11e8-b4b6-5328ee4e409c.html

[4] D. A. Protonotarios, "Study for the Development of a Railway Network in Crete, Greece", Master Thesis, Division of Highway and Railway Engineering, Department of Transport Science, School of Architecture and the Built Environment, Stockholm Royal Institute of Technology (KTH), Stockholm, Sweden, (2012), Available online at: http://www.diva-portal.org/smash/get/diva2:549681/FULLTEXT01.pdf.

[5] J. Waite, "Sugar Railways on Negros", FarRail, (2007), Available online at: https://www.internationalsteam.co.uk/trains/negros06.htm

[6] V. M. Satchell and C. Sampson, "The Rise and Fall of Railways in Jamaica, 1845–1975", The Journal of Transport History, Vol. 24, No. 1, pp. 1-21, (2003).

[7] E. Campbell, "Railway Corporation To End Passenger Service", Jamaica – The Gleaner, (2012), Available online at: http://jamaica-gleaner.com/gleaner/20120814/lead/lead9.html

[8] M. Kosambi and J. E. Brush. "Three colonial port cities in India", Geographical Review, pp. 32-47, (1988).

[9] B. Mckillop and M. Pearson, "End of the Line: A History of Railways in Papua New Guinea", Port Moresby: University of Papua New Guinea Press, (1997).

[10] R. Diemer, "Transport in the European Union Current Trends and Issues", Overview of the Transport Sectors in the EU Countries – Ireland, European Commission, Directorate-General Mobility and Transport, Brussels, pp. 55-59, (2019).

[11] Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EC) No 1370/2007 concerning the opening of the market for domestic passenger transport services by rail, Part 3, (2013).

[12] "Trains in Puerto Rico: San Juan", Available online at: http://mapa-metro.com/en/puerto-rico/san-juan/san-juan-tren-urbano-map.htm

[13] N. H. M. Wilson, "Public Transport Organizational Models: A Critical Appraisal and Prospects for Future Industry Restructuring", MIT, (1996).

[14] American Public Transportation Association (APTA), "Public Transportation Ridership Report - First Quarter 2018", (2018).

[15] Puerto Rico Chapter 9 Uniformity Act of 2015, Hearing Before the Subcommittee on Regulatory Reform, Commercial and Antitrust Law of the Committee on the Judiciary, House of Representatives, One Hundred Fourteenth Congress, First Session, on H.R. 870, U.S. Government Publishing Office, p. 70, February 26, (2015).

[16] R. Puentes, A. Tomer and J. W. Kane, " A New Alignment: Strengthening America's Commitment to Passenger Rail", State and Metropolitan Innovation, The Brookings Institution, Washington, DC, USA, (2013).

[17] United States Census Bureau, "State Population Totals and Components of Change: 2010-2019", (2020), Available on at: https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html

[18] P. M. Bösch, F. Becker, H. Becker, and K. W. Axhausen, "Cost-based analysis of autonomous mobility services", Transport Policy 64, pp. 76-91, (2018).

[19] Y. Wiseman, "Driverless Cars will Make Union Stations Obsolete", The Open Transportation Journal, Vol. 13, pp. 109-115, (2019).

[20] P. Fernandes and U. Nunes, "Platooning with IVC-enabled autonomous vehicles: Strategies to mitigate communication delays, improve safety and traffic flow", IEEE Transactions on Intelligent Transportation Systems, Vol. 13, No. 1, pp. 91-106, (2012).

[21] D. Carlino, M. Depinet, P. Khandelwal and P. Stone. "Approximately orchestrated routing and transportation analyzer: Large-scale traffic simulation for autonomous vehicles", In 15th International IEEE Conference on Intelligent Transportation Systems (ITSC), pp. 334-339, (2012).

[22] Y. Wiseman, "Autonomous Vehicles", Encyclopedia of Organizational Knowledge, Administration, and Technologies, First Edition, (2020).

[23] Y. Wiseman, "Ancillary Ultrasonic Rangefinder for Autonomous Vehicles", International Journal of Security and its Applications, Vol. 12(5), pp. 49-58, (2018).

[24] Y. Wiseman, "Driverless Cars will Make Passenger Rails Obsolete", IEEE Technology and Society, Vol. 38(2), pp. 22-27, (2019).

[25] Y. Wiseman, "In an Era of Autonomous Vehicles, Rails are Obsolete", International Journal of Control and Automation, Vol. 11(2), pp. 151-160, (2018).

[26] O. Redler, "How much does it cost us? The public transport scandal in Israel", Mida, (2015), Available online at: https://mida.org.il/2015/09/29/%D7%9B%D7%9E%D7%94-%D7%96%D7%94-%D7%A2%D7%95%D7%9C%D7%94-%D7%9C%D7%A0%D7%95-%D7%94%D7%AA%D7%97%D7%91%D7%95%D7%A8%D7%94-%D7%94%D7%A6%D7%99%D7%91%D7%95%D7%A8%D7%99%D7%AA-%D7%91%D7%99%D7%A9%D7%A8%D7%90/

[27] Israel Railways, Annual Report for the year 2018, p. 50, (2018), Available online at: https://mayafiles.tase.co.il/rpdf/1219001-1220000/P1219831-00.pdf

[28] A. Barkat, "MAATS to Drivers: Do not approach Highway 1 from 2013 to 2015", Globes, (2012), Available online at: https://www.globes.co.il/news/article.aspx?fbpdid=1000752080

[29] Y. Itiel, "The Line will Become a Hit": The Fast Train From Jerusalem to Tel Aviv Gets Underway", Walla News, (2019), Available online at: https://news.walla.co.il/item/3330578

[30] L. Tamari, "More Than 9000 Trips were Made on The New Jerusalem Railway a Day in The Past Month", My-Net-Jerusalem, (2019), Available online at: http://mynetjerusalem.co.il/%d7%97%d7%93%d7%a9%d7%95%d7%aa/%d7%9e%d7%97%d7%a8-%d7%91-%d7%99%d7%93%d7%99%d7%a2%d7%95%d7%aa-%d7%99%d7%a8%d7%95%d7%a9%d7%9c%d7%99%d7%9d-%d7%90%d7%9c%d7%94-%d7%94%d7%9b%d7%95%d7%aa%d7%a8%d7%95%d7%aa-%d7%a9%d7%a2%d7%a9%d7%95-%d7%90%d7%aa-%d7%94%d7%a9%d7%91%d7%95%d7%a2-429256/7

[31] Israel Ministry of Transportation, "Ways to Change The Characteristics of The Use of a Private Vehicle and The Consequent Traffic and Economic Results", (2015), Available online at: https://docs.wixstatic.com/ugd/eff2a0_a9f1e34d563b47c3bc492be7f3057188.pdf

[32] H. W. Dickinson. "A Short History of the Steam Engine", Cambridge University Press, New-York, USA, (2011).

[33] R. Sparrow and M. Howard, "When human beings are like drunk robots: Driverless vehicles, ethics, and the future of transport", Transportation Research Part C: Emerging Technologies, Vol. 80, pp. 206-215, (2017).

[34] R. B. Yehezkael, Y. Wiseman, H. G. Mendelbaum and I. L. Gordin, "E1periments in Separating Computational Algorithm from Program Distribution and Communication", LNCS of Springer Verlag Vol. 1947, pp. 268-278, 2001.

[35] Y. Wiseman, "A Pipeline Chip for Quasi Arithmetic Coding", IEICE Journal - Trans. Fundamentals, Tokyo, Japan, Vol. E84-A(4), pp. 1034-1041, 2001.

[36] E. Fredj and Y. Wiseman, "An O(n) Algorithm for Edge Detection in Photos Compressed by JPEG Format", Proc. IASTED International Conference on Signal and Image Processing SIP-2001, Honolulu, Hawaii, pp. 304-308, 2001.

[37] Y. Wiseman and E. Fredj, "Contour E4traction of Compressed JPEG Images", ACM - Journal of Graphic Tools, Vol. 6(3), pp. 37-43, 2001.

[38] Y. Wiseman, K. Schwan and P. Widener, "Efficient End to End Data E5change Using Configurable Compression", Proc. The 24th IEEE Conference on Distributed Computing Systems (ICDCS 2004), Tokyo, Japan, pp. 228-235, 2004.

[39] Y. Wiseman, "ARC Based SuperPaging", Operating Systems Review, Vol. 39(2), pp. 74-78, 2005.

[40] Y. Wiseman, "Advanced Non-Distributed Operating Systems Course", ACM - Computer Science Education, Vol. 37(2), pp. 65-69, 2005.

[41] M. Reuven and Y. Wiseman, "Reducing the Thrashing Effect Using Bin Packing", Proc. IASTED Modeling, Simulation, and Optimization Conference, MSO-2005, Oranjestad, Aruba, pp. 5-10, 2005.

[42] M. Reuven and Y. Wiseman, "Medium-Term Scheduler as a Solution for the Thrashing Effect", The Computer Journal, O9ford University Press, Swindon, UK, Vol. 49(3), pp. 297-309, 2006.

International Journal of xxxxxx
Vol. x, No. x, xxxxx, 20xx

[43] Y. Wiseman, "The Relative Efficiency of LZW and LZSS", Data Science Journal, Vol. 6, pp. 1-6, 2007.

[44] Y. Wiseman and I. Gefner, "Conjugation Based Compression for Hebrew Te11ts", ACM Transactions on Asian Language Information Processing, Vol .6(1), article no. 4, 2007.

[45] Y. Wiseman, "Burrows-Wheeler Based JPEG", Data Science Journal, Vol. 6, pp. 19-27, 2007.

[46] I. Grinberg and Y. Wiseman, "Scalable Parallel Collision Detection Simulation", Proc. Signal and Image Processing (SIP-2007), Honolulu, Hawaii, pp. 380-385, 2007.

[47] Y. Wiseman, "ASOSI: Asymmetric Operating System Infrastructure", Proc. 21st Conference on Parallel and Distributed Computing and Communication Systems, (PDCCS 2008), New Orleans, Louisiana, pp. 193-198, 2008.

[48] Y. Wiseman, J. Isaacson and E. Lubovsky, "Eliminating the Threat of Kernel Stack Overflows", Proc. IEEE Conference on Information Reuse and Integration (IEEE IRI-2008), Las Vegas, Nevada, pp. 116-121, 2008.

[49] M. Itshak and Y. Wiseman, "AMSQM: Adaptive Multiple SuperPage Queue Management", Proc. IEEE Conference on Information Reuse and Integration (IEEE IRI-2008), Las Vegas, Nevada, pp. 52-57, 2008.

[50] P. Weisberg and Y. Wiseman, "Using 4KB Page Size for Virtual Memory is Obsolete", Proc. IEEE Conference on Information Reuse and Integration (IEEE IRI-2009), Las Vegas, Nevada, pp. 262-265, 2009.

[51] Y. Wiseman, "Take a Picture of Your Tire!", Proc. IEEE Conference on Vehicular Electronics and Safety (IEEE ICVES-2010) Qingdao, ShanDong, China, pp. 151-156, 2010.

[52] R. Ben Yehuda and Y. Wiseman, "The Offline Scheduler for Embedded Transportation Systems", Proc. IEEE Conference on Industrial Electronics (IEEE ICIT-2011), Auburn, Alabama, pp. 449-454, 2011.

[53] D. Livshits and Y. Wiseman, "Cache Based Dynamic Memory Management For GPS", Proc. IEEE Conference on Industrial Electronics (IEEE ICIT-2011), Auburn, Alabama, pp. 441-446, 2011.

[54] Y. Wiseman, "The Effectiveness of JPEG Images Produced By a Standard Digital Camera to Detect Damaged Tyres", World Review of Intermodal Transportation Research, Vol. 4(1), pp. 23-36, 2013.

[55] Y. Wiseman and P. Weisberg, "Economical Memory Management for Avionics Systems", IEEE/AIAA 31st Digital Avionics Systems Conference (DASC), 2013.

[56] Y. Wiseman and A. Barkai, "Diminishing Flight Data Recorder Size", IEEE/AIAA 31st Digital Avionics Systems Conference (DASC), 2013.

[57] R. Ben Yehuda and Y. Wiseman, "The Offline Scheduler for Embedded Vehicular Systems", International Journal of Vehicle Information and Communication Systems, Vol. 3(1), pp. 44-57, 2013.

[58] D. Livshits and Y. Wiseman, "The Ne26t Generation GPS Memory Management", International Journal of Vehicle Information and Communication Systems, Vol. 3(1), pp. 58-70, 2013.

[59] Y. Wiseman, "Fuselage Damage Locator System", Advanced Science and Technology Letters, Vol. 37, pp. 1-4, 2013.

[60] I. Grinberg and Y. Wiseman, "Scalable Parallel Simulator for Vehicular Collision Detection", International Journal of Vehicle Systems Modelling and Testing, Vol. 8(2), pp. 119-144, 2013.

[61] Y. Wiseman and A. Barkai, "Smaller Flight Data Recorders", Journal of Aviation Technology and Engineering, Vol. 2(2), pp. 45-55, 2013.

[62] Y. Wiseman, "Camera That Takes Pictures of Aircraft and Ground Vehicle Tires Can Save Lives", Journal of Electronic Imaging, Vol. 22(4), 041104, 2013.

[63] P. Weisberg and Y. Wiseman, "Efficient Memory Control for Avionics and Embedded Systems", International Journal of Embedded Systems, Vol. 5(4), pp. 225-238, 2013.

[64] Y. Wiseman, "Steganography Based Seaport Security Communication System", Advanced Science and Technology Letters, Vol. 46, pp. 302-306, 2014.

[65] Y. Wiseman, "Device for Detection of Fuselage Defective Parts", Information Journal, Tokyo, Japan, Vol. 17(9(A)), pp. 4189-4194, 2014.

12

[66] P. Weisberg, Y. Wiseman and J. Isaacson, "Enhancing Transportation System Networks Reliability by Securer Operating System", Open Journal of Information Security and Applications, Vol. 1(1), pp. 24-33, 2014.

[67] Y. Wiseman, "Noise Abatement at Ben-Gurion International Airport", Advanced Science and Technology Letters, Vol. 67, pp. 84-87, 2014.

[68] Y. Wiseman, "The still image lossy compression standard – JPEG", Encyclopedia of Information and Science Technology, Third Edition, Vol. 1, Chapter 28, pp. 295-305, 2014.

[69] Y. Wiseman, "Protecting Seaport Communication System by Steganography Based Procedures", International Journal of Security and Its Applications, Sandy Bay, Tasmania, Australia, Vol. 8(4), pp. 25-36, 2014.

[70] Y. Wiseman, "Noise Abatement Solutions for Ben-Gurion International Airport", International Journal of U- and E-Service, Science and Technology, Vol. 7(6), pp. 265-272, 2014.

[71] P. Weisberg and Y. Wiseman, "Virtual Memory Systems Should Use Larger Pages rather than the Traditional 4KB Pages", International Journal of Hybrid Information Technology, Vol. 8(8), pp. 57-68, 2015.

[72] Y. Wiseman, "Improved JPEG based GPS picture compression", Advanced Science and Technology Letters, Vol. 85, pp. 59-63, 2015.

[73] Y. Wiseman, "Diminution of JPEG Error Effects", The Seventh International Conference on Future Generation Information Technology, Vol. 117, pp. 6-9, 2015.

[74] Y. Wiseman, "Enhancement of JPEG Compression for GPS Images", International Journal of Multimedia and Ubiquitous Engineering, Vol. 10(7), pp. 255-264, 2015.

[75] P. Weisberg and Y. Wiseman, "Virtual Memory Systems Should use Larger Pages", Advanced Science and Technology Letters, Vol. 106, pp. 1-4, 2015.

[76] Y. Wiseman and Y. Giat, "Red Sea and Mediterranean Sea Land Bridge via Eilat", World Review of Intermodal Transportation Research, Vol. 5(4), pp. 353-368, 2015.

[77] Y. Wiseman, "Alleviation of JPEG Inaccuracy Appearance", International Journal of Multimedia and Ubiquitous Engineering, Vol. 11(3), pp. 133-142, 2016.

[78] Y. Wiseman, "Can Flight Data Recorder Memory Be Stored on the Cloud?", Journal of Aviation Technology and Engineering, Vol. 6(1), 16-24, 2016.

[79] Y. Wiseman and I. Grinberg, "Autonomous Vehicles Should Not Collide Carelessly", Advanced Science and Technology Letters, Vol. 133, pp. 223-228, 2016.

[80] Y. Wiseman and Y. Giat, "Multi-modal passenger security in Israel", Multimodal Security in Passenger and Freight Transportation: Frameworks and Policy Applications, Edward Elgar Publishing Limited, Chapter 16, pp. 246-260, 2016.

[81] Y. Wiseman, "Traffic Light with Inductive Detector Loops and Diverse Time Periods", Contemporary Research Trend of IT Convergence Technology, Vol. 4, pp. 166-170, 2016.

[82] Y. Wiseman, "Unlimited and Protected Memory for Flight Data Recorders", Aircraft Engineering and Aerospace Technology, Vol. 88(6), pp. 866-872, 2016.

[83] Y. Wiseman and I. Grinberg, "When an Inescapable Accident of Autonomous Vehicles is Looming", International Journal of Control and Automation, Vol. 9(6), pp. 297-308, 2016.

[84] Y. Wiseman, "Conceptual Design of Intelligent Traffic Light Controller", International Journal of Control and Automation, Vol. 9(7), pp. 251-262, 2016.

[85] Y. Wiseman, "Compression Scheme for RFID Equipment", Proc. IEEE International Conference on Electro Information Technology (EIT 2016), Grand Forks, North Dakota, USA, pp. 387-392, 2016.

[86] Y. Wiseman and I. Grinberg, "Circumspectly Crash of Autonomous Vehicles", Proc. IEEE International Conference on Electro Information Technology (EIT 2016), Grand Forks, North Dakota, USA, pp. 382-386, 2016.

[87] Y. Wiseman, "Efficient RFID Devices", Proc. The 42nd Annual Conference of IEEE Industrial Electronics Society (IECON 2016), Firenze (Florence), Italy, pp. 4762-4766, 2016.

[88] Y. Wiseman, "Computerized Traffic Congestion Detection System", International Journal of Transportation and Logistics Management, Vol. 1(1), pp. 1-8, 2017.

13

[89] Y. Wiseman, "Remote Parking for Autonomous Vehicles", International Journal of Hybrid Information Technology, Vol. 10(1), pp. 313-324, 2017.

[90] Y. Wiseman, "Tool for Online Observing of Traffic Congestions", International Journal of Control and Automation, Vol. 10(6), pp. 27-34, 2017.

[91] Y. Wiseman, "Safety Mechanism for SkyTran Tracks", International Journal of Control and Automation, Vol. 10(7), pp. 51-60, 2017.

[92] Y. Wiseman, "Self-Driving Car - A Computer will Park for You", International Journal of Engineering and Technology for Automobile Security, Vol. 1(1), pp. 9-16, 2017.

[93] Y. Wiseman, "Real-Time Monitoring of Traffic Congestions", IEEE International Conference on Electro Information Technology (EIT 2017), Lincoln, Nebraska, USA, pp. 501-505, 2017.

[94] Y. Wiseman, "Automatic Alert System for Worn Out Pipes in Autonomous Vehicles", International Journal of Advanced Science and Technology, Vol. 107, pp. 73-84, 2017.

[95] Y. Wiseman, "Vehicle Identification by OCR, RFID and Bluetooth for Toll Roads", International Journal of Control and Automation, Vol. 11(9), pp. 67-76, 2018.

[96] Y. Wiseman and I. Grinberg, "The Trolley Problem Version of Autonomous Vehicles", The Open Transportation Journal, Vol. 12, pp. 105-113, 2018.

[97] Y. Wiseman, "Compaction of RFID Devices using Data Compression", IEEE Journal of Radio Frequency Identification, Vol. 1(3), pp. 202-207, 2018.

[98] Y. Wiseman, "Efficient Embedded Computing Component for Anti-Lock Braking System", International Journal of Control and Automation, Vol. 11(12), pp. 1-10, 2018.

[99] Y. Wiseman, "Efficient Embedded Images in Portable Document Format (PDF)", International Journal of Advanced Science and Technology, Vol. 124, pp. 129-138, 2019.

[100] Y. Wiseman, Israel Complementary International Airport, International Journal of Control and Automation, Vol. 12(7), pp. 1-10, 2019.

[101] Y. Wiseman, "High Occupancy Vehicle Lanes are an Expected Failure", International Journal of Control and Automation, Vol. 12(11), pp. 21-32, 2019.

[102] Y. Wiseman, "Conjoint Vehicle License Plate Identification System", Technical Report, 2020.

[103] Y. Wiseman, "Blaumilch Canal on Ayalon Highway", Daaton, (2015), Available online at: http://www.daaton.co.il/Article.aspx?id=3290

[104] Y. Wiseman, "Adjustable and Automatic Flush Toilet", Technical Report, 2020.

[105] M. Dreyfuss and Y. Giat, "Optimal spares allocation to an exchangeable-item repair system with tolerable wait", European Journal of Operational Research 261 (2), pp. 584-594, 2017.

[106] Y. Giat, "The effects of output growth on preventive investment policy", American Journal of Operations Research 3 (06), pp. 474-486, 2013.