



Assessment of Hydrogen Mobility utilising MCDM method

*Kurinjimalar Ramu, M. Ramachandran, Prabakaran Nanjundan

REST Labs, Kaveripattinam, Krishnagiri, Tamil Nadu, India

*Corresponding author Email: kurinjimalar@restlabs.in

Abstract: Hydrogen mobility project in leh it is a pilot project lay five fuel cell buses and being driven around it aims to this project for general use in India fuel cell electric vehicles the first is deployment. hydrogen mobility projects world all started. Hydrogen fuel it up to demonstrate reliability vehicles and refuelling for planning the introduction of stations efforts by industry and government these combines. In Ireland, early hydrogen mobility debates occur, but they are in very early stages. The weighted sum method is a multi-criteria decision-making method, there are many alternatives and we must decide which is the best alternative based on many criteria. Alternative: Bucharest, Cluj-Napoca, Iasi, Timisoara. Evaluation Preference: Demography, Fleet, Refuelling infrastructure, Road infrastructure, Economy. From the result it is seen that Road infrastructure is got the first rank where as is the Fleet is having the lowest rank. As a result, road infrastructure has got the first rank, where the Navy has got the lowest rank.

Keywords: Hydrogen movement, Weighted sum model, Demography, Fleet, Refuelling infrastructure and Road infrastructure.

1. Introduction

Hydrogen movement is in transit describe the roles that hydrogen can take is a blanket term used. Currently, we are a fossil fuel society we have an economy based on it is a severe air quality pollution, global warming and sustainability leading to complications. Governments this responding to concerns, our future mobility needs are met more consistently it has been decided that it will be done. This hydrogen plays an important role in the conversion. Hydrogen mobility Europe is fuel cell electric vehicle (FCEV) hydrogen refueling for drivers the first truly pan-European of stations one that provides access to the network is the master plan. The h2me project is European hydrogen vehicle fleet significantly expand. Through this vehicles, fuel stations and hydrogen production techniques technical and commercial readiness aim to confirm. When vehicles are heavy hydrogen from full battery electric vehicles clearly differentiates itself so buses, trucks, trains and fuel cell for use in boats the use of technology is rapidly advancing is coming renewable resources and green carbon based on hydrogen for Ladakh to create the non-existent economy this scheme will help NTPC. Green hydrogen the plan is to achieve a low carbon footprint another step. The weighted sum method is a multi-criteria decision-making method. There will be many alternatives, and many best in terms of criteria we must determine the alternative. Weighted sum model (WSM), weighted linear combination (WLC) or simple additive also known as weighting (SAW) multiple alternatives based on decision criteria.

Hydrogen Mobility

Hydrogen mobility at various hrs levels and stress levels in vital movement studies although widely researched. In these studies plants and facilities mostly are ignored. A particular hydrogen a gas station is also typical stations are not considered, instead considered. In addition, often considered electricity from wind turbines (30-50 kwel). The output forces are currently installed status does not reflect. From water electrolysis hydrogen and hydrogen provided these emissions from movement substantial to determine quantitative research has been carried out [1]. Hydrogen mobility to 2050 fuel is needed, and in the gas, phase achieve 5% concentration (by volume) of hydrogen, and produce about 33 twh. Hydrogen mobility (h2m) infrastructure. Comparatively having weak electric currents in the islands, or neighboring the United Kingdom limited interconnection with grids in annexed areas, a domestic solution the implementation requirement is relatively low facing renewable energy penetration want hydrogen movement in France and power-to-gas (p2g). Excessive energy to operate to help shape the opportunity for use, this investigation is the latest nuclear power generation considering the profiles. So, this available in France, from initial research current size of excess nucleus, meeting 2050 hydrogen mobility demand estimated electricity demand for it is clear that there is more than [2]. Hydrogen mobility of in the model potential is expected. Some like steel analytical radical hydrogen in materials complicated by motion. For those models, hydrogen to obtain accurate results for others such as atomic and bulk analysis methods are required. The objective of this thesis is to overview of hydrogen measurement methods is to provide, especially deep for profiles, more relevant analysis information to help you choose a technique is to provide. Essay by injecting hydrogen into silicon SIMS and nuclear focus on reaction analysis (NRA) methods analytical hydrogen mobility is free of problems an example of an object and more for a substance with hydrogen mobility analysis of hydrogen in niobium [3]. Silicon is a comprehensive classification means, also silicon (100) is hydrogen of objects that do not exhibit motion the scales were used for analysis. Niobium is very high in hydrogen

movement is one of different meaning. Niobium is important, because of its high purity niobium superconducting radio bandwidth is the accelerator it is an exam subject for modules. H2me is the largest passenger vehicle and hydrogen refueling a demonstration initiative of the station fuel cells and hydrogen is a joint venture (fch ju). Co-financing. European hydrogen a European to publish the network hydrogen mobility approach h2me Europe to begin with unites leading national efforts [4]. Second moment and hydrogen motion temperature dependence of the values of the two proteins on the mechanics provide surface properties insight. Of the two proteins second against temperature maps moment has two categories. Low the independent plateau temperature area temperature while in the high temperature section values are subject to change. Second division of constant value of moments are tough for the status quo proof. A single value, in contrast, even compared to a theoretical model, hard-lattice state (solid spin structure) can't talk about. Value of HM, each the average mobility of the hydrogen pair provides over a wide temperature range measurements carried out are HM hydrogen required to determine movement values enable normalization. Every to the molecule's own immobile state ($M2r$ solid state) normalization is done and for this purpose a low temperature spectrum is required [5]. A significant narrowing of the nanocomposites is 1 h NMR resonances within mgh2 nanodomains motion-averaged due to hydrogen motion reflects the effect. Hydrogen atoms the more they go, the more theirs (average) dipole interactions are reduced to 1 h the NMR resonance becomes narrower. In nanocomposites increased hydrogen mobility 1 h NMR spin-lattice confirmed by relaxation, it is e^{-10-12} sensitivity to motion on the -8 s^{-1} time scale has more movement, this kind of relaxation change rapidly. Mg at 300 °c with 18 bar h 2 $\approx 80\%$ efficiency within 15 min for Nano particles absorbed. For different MgH 2 amounts [6]. A challenge in introducing hydrogen current price vehicles and infrastructure is infrastructure partners and automakers both 'phases iii' significantly higher in committed to providing 'vehicles', because large quantities cost significantly reducing and Germany hydrogen as the world's leading marketplace for mobility paving the way for change. Wide range of customers to the market with the performance of vehicles get ready. Performance, performance of the vehicle and more reliability upgrade. Integrating new partners, CEP to other areas expand. Hydrogen fuel of vehicles requiring stations to significantly increase the number, continue the expansion network. Production with energy from renewable sources use the hydrogen produced [7]. $Mg < = > 2H$, $Si < = > Mg + 2H$, and hydro garnet deficiency, including $Si < = > 4H$ consider several charge-balancing defects with, molecular based on density using kinetic simulations hydrogen in ringwoodite and wadslite we study movement. 1500 and 2500 the transition zone stresses between k and theory of operation at temperature. Diffusion we determine the coefficients and long of hydrogen during the simulations we study the mechanism of movement in detail [8]. It's for storing large amounts of hydrogen due to compatibility, hydrogen-based energy when economics was first proposed since, the intermetallic composition of tie is large attracted interest. High hydrogen solubility in addition, hydrogen storage is required for other qualities are specific surface properties and overall, the higher the hydrogen mobility. The latter is required in this article is discussed. 3-phase metal-hydrogen hydrogen diffusion coefficients in systems to measure regions such as nuclear magnetic resonance (NMR) and elastic neutron scattering (QNS). Spectroscopic methods are more successful are used. However, in the cy phase, will be done using these techniques signal intensities are sufficient for measurements no. Therefore, in contrast to NMR and QNS, long range due to initial imbalance based on observations of prevalence methods should be used [9]. Hydrogen in Romania site selection mobility roll-up. These methods are for decision makers weights, measures, substitutions and a collection of linguistic terms are set based. Performance of the proposed methods intuitive fuzzy from the literature is compared with the Romanian migration landscape the need to modernize the fleet and fresh and eco-friendly of refueling the structure this study begins with an explanation. The role of hydrogen mobility in Romania for the four locations, the population, navy, refueling infrastructure, 5 As road infrastructure and economy this work has 14 criteria in categories analyzes. All criteria have specific values. All the specific and given in the table evaluations of places and criteria, in intuitive fuzzy numbers translated assessment scales and using linguistic terms. Hydrogen mobility in Romania the ranking of the best site above for startups is proposed [10].

Weighted Sum Method (WSM)

To the best of our knowledge, only the precedence relation is used for the given solutions to continuous multi-objective optimization problems. In a classic weighted sum model, unsupported solutions are pruned with this optional link [11]. A multi-criteria decision for weighted sum method (WSM) ranking cameras approach. The proposed system, to calculate the preference score of the alternatives weighted sum method (WSM) approach was used. For WSM for result team scores and features has relative weight. Customer reviews as scores were used. Weights are a concept is the average number of customers served [12]. Weighted sum method and weighted product method are the score of an alternative is equal to the weighted sum of its evaluation, in the weighted sum method, where the weights are the principal weights associated with each attribute. Performance scores in weighted product mode, instead of calculating efficiency scores, change the multiplier to the importance of scores are elevated to gravity [13]. The weighted sum method is finally multiplication in reality subtraction work, to perform addition and sorting want how about candidate keywords. Are created and represented so far we have talked. A four-dimensional feature the weighted sum of the vector, to get we still lose the weight vector. Four features also have different parsing ability since we need weights. This feature keywords and keywords the more you can discriminate, the better can be detected manually, actually the weight vector for the domain to determine it's too much to do manually if you try time consuming [14]. The proposed adaptive weighted sum systematic, a priori weight selections instead of using weights by altering, additional inequality also by specifying constraints focuses on unexplored areas. The adaptive weight sum method works well creates distributed solutions, pareto in non-convex regions find non-pare to top of the line answers which ignores most beneficial answers has been demonstrated. This last point is potential of normal boundary

crossing may be liable, otherwise a successful multi-purpose method, this is key caused by reliance on equality constraints [15]. A weighted sum multi-objective optimization (MOO) method, stable, is not ideal for providing multiple solution points by varying the weights, although additionally a set selection is included for a single answer that displays options continue to deliver the point is used. Weights. Weights to expose setting options an approach, and it's diverse applies to methods. Because of this, weights the solution for the weighted sum method understanding how affect others include similar method parameters has implications for attitudes [16]. Clinical computer-aided trauma diagnosis weighted sum method for algorithm in this paper is proposed. Trauma is medical most urgent physiology in medicine is a symptom. It is for multiple organ failure led to this hypothetical method is that of the doctor the verdicts are absolutely shocking. Experienced many are built by a medical professional a knowledge base with probability weights there are more details on each route there are and each for each object shock types also have their respective weights. Some the items are then scattered across the server, moderate and mild. In this study data were collected from nine patient's analysis is done. The results are the sum of the two-level weights give order of shock type by method [17]. Weighted sum method, decomposition based on evolutionary multi-objective (EMO) often used in algorithms scaling method, along with other measuring methods compared, computationally easier and good features like high search capability contains however, non-convex this is by losing the effect on complications is often criticized. This study advantage of weighted sum method seeks to use, because of its evil unaffected, multi-objective problems resolves. A new decomposition called moea/d-lws based on the EMO algorithm proposed, in which the weighted amount the method is used locally [18]. So much for multi objective optimization a widely used method is weighted is the sum method. The weighted sum approach systematically modifies the weights, and each exceptional unmarried objective optimization determines a unique best-fit solution. The obtained solutions are pared to front approximations. Non-specific anchor points are weights with values of 0, the most useful responses if there is any weak pare to can be generated please note that weighted early works of sum system, configure the weighted sum method seen in use for optimization [19]. Included in the final category is the weighted sum approach only considered and most widely used of all possibilities. During the selection technique, the proposed set of rules uses three objective functions. Entropy, a weighted completely matched column (WFMC) and a base pair score (BPS). Weighted sum approach to combine these three functions, we have the well-known aggregation function [20]. Gray numbers indicate data ranges uses and alternatives gray for rating and ranking weighted sum model (GWSM) we propose which may influence the results to check for changes; wide range considering the uncertainties the best country in Gambia is west Africa. Long-term GWSM is too high for investors. Considers environmental uncertainty over many years. Considers environmental uncertainty over many years. It is recommended that GWSM is a business. [21]

Analysis and Discussion

Bucharest it is seen that Demography is showing the highest value for Economy is showing the lowest value. Cluj-Napoca it is seen that Demography is showing the highest value for Fleet is showing the lowest value. Iasi it is seen that Fleet is showing the highest value for Road infrastructure is showing the lowest value. Timisoara it is seen that Demography is showing the highest value for Economy is showing the lowest value.

TABLE 1. Hydrogen Mobility

	Bucharest	Cluj-Napoca	Iasi	Timisoara
Demography	96.000	92.530	38.150	45.050
Fleet	87.120	74.970	43.690	27.300
Refueling infrastructure	94.080	89.580	29.180	33.100
Road infrastructure	83.170	68.280	14.600	27.590
Economy	73.330	86.410	37.960	18.890

Table 1 shows the Hydrogen Mobility Alternative: Bucharest, Cluj-Napoca, Iasi, Timisoara. Evaluation Preference: Demography, Fleet, Refueling infrastructure, Road infrastructure, Economy.

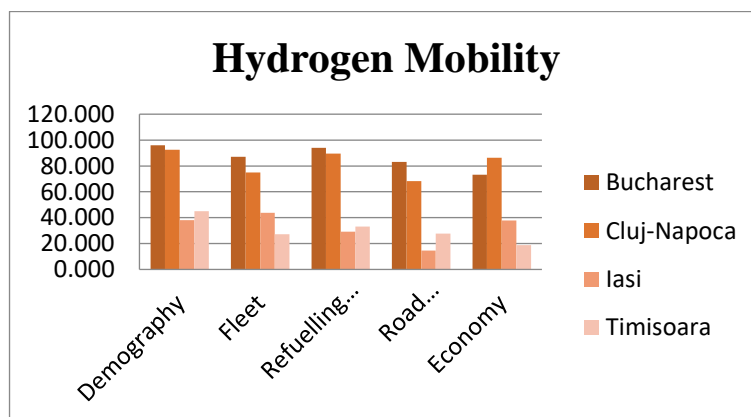


FIGURE 1. Hydrogen Mobility

Figure 1 shows the graphical representation Alternative: Bucharest, Cluj-Napoca, Iasi, Timisoara. Evaluation Preference: Demography, Fleet, Refueling infrastructure, Road infrastructure, Economy.

TABLE 2. Normalized Data

Normalized Data			
1.00000	1.00000	0.38270	0.41931
0.90750	0.81022	0.33417	0.69194
0.98000	0.96812	0.50034	0.57069
0.86635	0.73792	1.00000	0.68467
0.76385	0.93386	0.38462	1.00000

Table 2 shows the Normalized Data for Hydrogen Mobility Alternative: Bucharest, Cluj-Napoca, Iasi, Timisoara. Evaluation Preference: Demography, Fleet, refueling infrastructure, Road infrastructure, Economy it is also Maximum or Minimum value =C5/MAX (\$C\$4: \$C\$8), =MIN (\$D\$4: \$D\$8)/D6 Normalized Data formula used.

TABLE 3. Weight

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 3 shows the Weightages used for the analysis. We had taken same weights for all the parameters for the analysis.

TABLE 4. Weighted normalized decision matrix

Weighted normalized decision matrix			
0.25000	0.25000	0.09567	0.10483
0.22688	0.20256	0.08354	0.17299
0.24500	0.24203	0.12509	0.14267
0.21659	0.18448	0.25000	0.17117
0.19096	0.23346	0.09615	0.25000

Table 4 shows the Weighted Normalized Decision Matrix. Alternative: Bucharest, Cluj-Napoca, Iasi, Timisoara. Evaluation Preference: Demography, Fleet, refueling infrastructure, Road infrastructure, Economy it is also Weighted Normalized Decision Matrix value multiplication formula used.

TABLE 5. Preference Score

Preference Score
0.70050
0.68596
0.75479
0.82224
0.77058

Table 5. Shows the Preference Score Demography= 0.70050, Fleet= 0.68596, Refueling infrastructure =0.75479, Road infrastructure=0.82224, Economy=0.77058.

TABLE 6. Rank

	Rank
Demography	4
Fleet	5
Refueling infrastructure	3
Road infrastructure	1

Economy	2
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Table 5. shows the final result of this paper the Demography is in Fourth rank, the Fleet is in Fifth rank, the Refueling infrastructure is in Third rank, the Road infrastructure is in First rank and the Economy is in Second rank.

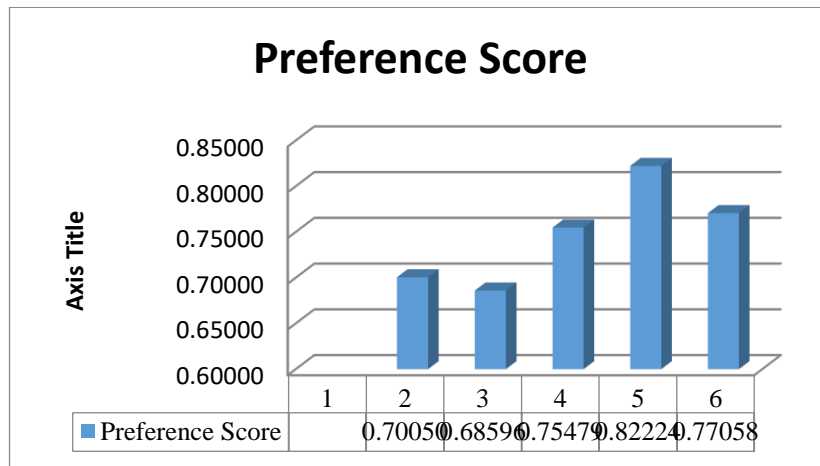


FIGURE 2. Preference Score

Figure 2 shows the preference Score for Fleet is showing the highest value for Road infrastructure is showing the lowest value.

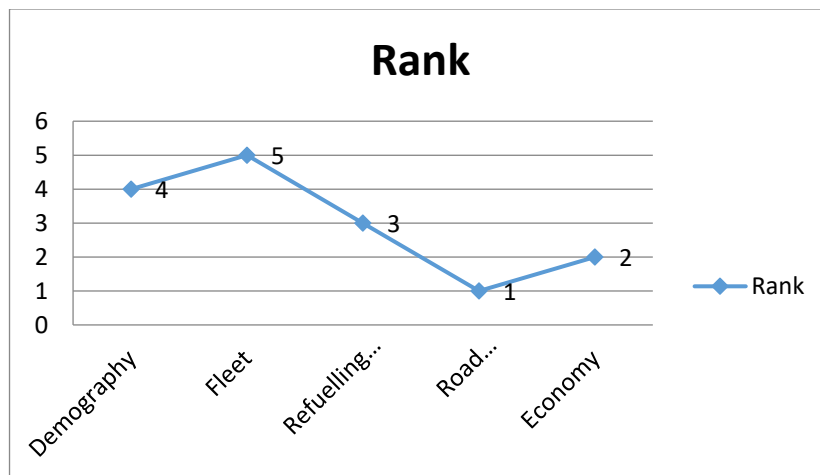


FIGURE 3. Rank

Figure 3 shows the graphical view of the final result of this paper the Demography is in 4th rank, the Fleet is in 5th rank, the Refueling infrastructure is in 3rd rank, the Road infrastructure is in 1st rank and the Economy is in 2nd rank.

Conclusion

Hydrogen mobility project in leh it is a pilot project lay five fuel cell buses and being driven around it aims to this project for general use in India fuel cell electric vehicles the first is deployment. Hydrogen mobility projects world all started. Hydrogen fuel it up to demonstrate reliability vehicles and refueling for planning the introduction of stations efforts by industry and government these combines. In Ireland, early hydrogen mobility debates occur, but they are in very early stages. The weighted sum method is a multi-criteria decision-making method. There will be many alternatives, and many best in terms of criteria we must determine the alternative. Weighted sum model (WSM), weighted linear combination (WLC) or simple additive also known as weighting (SAW) multiple alternatives based on decision criteria. This paper ranks population at number four, navy at number five, refueling infrastructure at number three, road infrastructure at number one and economy at number two.

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