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Analysis of performance-based issues in green transportation management systems in smart cities

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Abstract

Purpose – In this paper, an intelligent information assisted communication transportation framework (II-CTF) has been introduced to reduce congestion, data reliability in transportation and the environmental effects.

Design/methodology/approach – The main concern of II-CTF is to mitigate public congestion using current transport services, which helps to improve data reliability under hazardous circumstances and to avoid accidents when the driver cannot respond reasonably. The program uses machine learning assistance to predict optimal routes based on movement patterns and categorization of vehicles, which helps to minimize congestion of traffic.

Findings – In II-CTF, scheduling traffic optimization helps to reduce the energy and many challenges faced by traffic managers in terms of optimization of the route, average waiting time and congestion of traffic, travel, and environmental impact due to heavy traffic collision.

Originality/value – The II-CTF definition is supposed to attempt to overcome some of the problems of the transportation environment that pose difficulties and make the carriage simpler, safer, more efficient and green for all.

Keywords Smart cities, Green transportation, Communication interactions, Communication transportation

Paper type Research paper

1. Human-Computer interaction for intelligent transportation systems

The intelligent transport management system is built into an information and communication technology network that makes it easier for the citizens of cities to fly (Alavi *et al.*, 2018). It is important to provide a network that is seamless, uncomplicated, and fast, as millions prefer to travel around the public transport alternatives. A smart system for transport management is not smooth and fast, safe and reliable (Curry *et al.*, 2018). This balance does not benefit travelers; instead, it makes the city more productive in general. Transport infrastructure expenditure to tackle the growing urbanization is not in short supply (Baskar *et al.*, 2019). However, to make our urban as centers, they should look beyond traditional development strategies such as road interconnections, building improvements, or the introduction of high-speed vehicles (Yang *et al.*, 2018).

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Cities and urban transportation systems face several challenges shown in the above Figure 1, including traffic congestion, inadequate parking space, unfair access to all residents, and lack of last-mile links, insufficient road safety or environmental pollution (Tanwar *et al.*, 2018). Smart transport can respond in the absence of perfect solutions while solving these painful points, which urban residents face today (Jegadeesan *et al.*, 2019). Smart transport solutions can address these challenges by providing an accessible, multi-modal, and intelligent integrated mechanism (Liu *et al.*, 2019). Smart transport is based on an integrated network that mostly includes multi-modal linked transport and automated traffic signals, tolls, and fare collection. Information integration monitors the system, integrates weather and traffic data, and connects emergency services and government agencies ' information (He *et al.*, 2017).

Smart services offer various advantages, from smart parking, car location, to route diversion alerts (Ejaz and Anpalagan, 2019). The intelligent transport ecosystem can be linked with real-time and updated data, passenger information management, traffic signal management, and vehicle health monitoring (Qian *et al.*, 2019). Optimized on-demand services can ensure that the population to suit their needs can use all transport modes. Shared mobility solutions can help to connect to the public transportation for the first and last mile, acting as feeder services and improving access to metro/rail/bus services (Jegadeesan *et al.*, 2019). If the use of multi-modal common mobility ensures robust and accessible public transportation, citizens can choose between train rides, business travel and leisure activities on all their commuting needs (Olufowobi and Bloom, 2019). There will be a reduction in the number of private cars that will help to minimize congestion and emissions (Abdel-Basset *et al.*, 2020). Smart transport is one of the key ways in which smart cities enhance citizens' daily life and improve sustainability. It consists of Information systems that collect traffic data, vehicle information and the use of various transport modes. Such programs can improve the capacity and accessibility of public transport, which helps to manage, monitor the use of private cars (Jalaney and Ganesh, 2019). New transport technology, which upgrades or introduces various modes of transportation, for example,

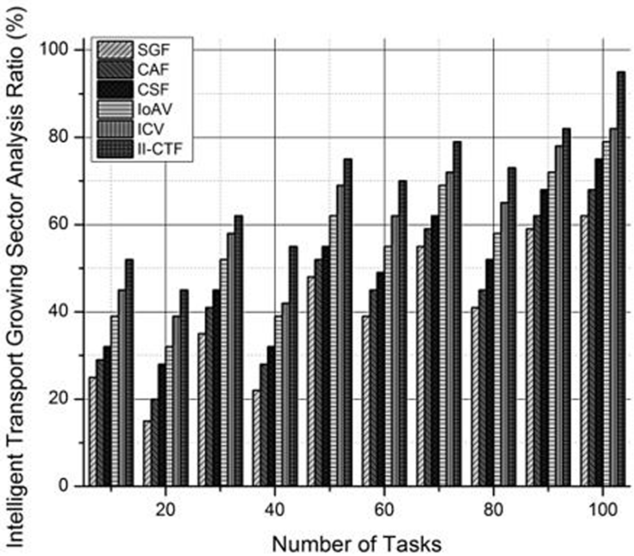

Figure 1.
Factors affecting the transportation sector

mobile apps that transform vehicles into ride-hailing services, cycle sharing (Al Zamil *et al.*, 2019), scooter rental, and more are connected cars which become a visible element of the town's transportation fabric (Mahmood, 2020). One of the critical goals of intelligent transportation systems is to reduce the reliance on private vehicles, make private transportation more attractive and enable urban residents and tourists to switch from private to public transport (Tewari and Gupta, 2020). Smart transport systems, for example, can limit private cars to specific routes and designate priority lanes for certain modes of transportation, or even entire highways (Anthony Jnr *et al.*, 2020).

The intelligent information assisted communication transportation framework (II-CTF) can revolutionize how people travel in metros and smart cities, and it offers a new approach offering various modes of transport, an advanced infrastructure, traffic, and mobility management solutions. It utilizes numerous electronics, wireless, and communications technologies to provide consumers with access to travel more intelligent, safe and secured and even quickly (Petrović and Kocić, 2020).

This paper demonstrates that understanding the place of Smart City is necessary to promote energy efficiency in urban areas and data reliability. First, it contributes to the global effect of urbanization on emissions, thereby showing the value of cities as 'better lives' partners. This connection between smart towns and transport is therefore discussed in this paper.

The rest of the paper discussed as follows: Section 1 and Section 2 presented the Human-Computer Interaction for Intelligent Transportation Systems and Background Study. In section 3, the intelligent information assisted communication transportation framework has been proposed to establish a sustainable transportation system. In Section 4, the numerical results have been performed. Finally, Section 5 concludes the research article.

2. Background study

S. SofanaReka *et al.*, proposed a Smart Grid Framework (SGF) (Reka and Dragicevic, 2018) that has drawn the world research community's attention, and the concept of integrating IoT with the smart grid shows the tremendous potential for growth. The contribution of the Internet of Things (IoT) to smart grids has gained enormous potential in today's energy management environment because of its multi-factor advantages in different fields. IoT paves the way for almost every domain of society to associate and control everything. This paper reveals the most critical research that focuses on the implementation of IoT on intelligent grids. It addresses various groundbreaking IoT and smart grids solutions as well as their respective applications in different fields.

Chang Choi *et al.* suggested a context-aware framework (CAF) (Choi *et al.*, 2018) for smart power device management. The architecture is based on context awareness, interpretation of the context ontology for the management of power equipment, a specification of the context ontology inference rules, and a context-aware inference method for power equipment management. The shift towards a more central and intelligent power supply, in particular, has created a wealth of energy metadata accessible via the IoT smart grid, allowing large-scale analytical services to predict energy usage and control patterns of use. The framework proposed some specific applications for system monitoring and system controls specifically to be implemented easily and efficiently in different application areas.

Abubakar Sadiq Sani *et al.* proposed cyber security framework (CSF) (Sani *et al.*, 2019) to provide appropriate protection and privacy to promote energy efficiency in energy internet. The need for cyber security is increasingly rising with a major increase in the IoT implementation in smart grid infrastructure. An identity-based protection mechanism, secure communication protocol, and intelligent energy management, security system guarantee safety and privacy in the Intelligent Security are included in the proposed structure. The formal verification and theoretical analysis reveal the improvement of security and confidentiality for IoT-based EI under our proposed framework.[AQ3].

A Nanda *et al.* focused on introducing the Internet of Autonomous Vehicle (IoAV) (Nanda *et al.*, 2019) without human intervention, and it aims to promote smart vehicle technology and autonomous driving. The IoT is a new technology that has acquired a large user base by facilitating the use of Internet-connected devices in numerous applications, including intelligent vehicle infrastructure. IoAV provides reliable, safe, seamless, and scalable communication between vehicles and on the road and offers a description of the autonomous vehicle communication system's configuration, properties, and safety risks.

D Xiaoping *et al.* introduced the intelligent and connected vehicle (ICV) (Xiaoping *et al.*, 2020) system as a traffic management solution. The sensing of vehicles can be improved by the sharing of information in real-time with cars, the roadside facilities, and the cloud network. The above addresses the issue of coordinating cars close to the bottleneck sites, such that vehicles can pass quickly and smoothly across the area, a lane consultation algorithm is intended to reduce conflict by promoting changes of the new lane. The algorithm will allow vehicles to change the road and drive further. The evaluation results summarized and showed that it improved the efficiency of traffic at different service levels concerning average speed, waiting time, and overall journey time and circulation rates.

Based on the above research, a constant increase in consumption demand has brought an urgent need for energy management across the globe. The danger to future generations is global warming and air pollution. It is due to the release of volume-increased gases, as energy demand increases. The transportation should be pollution free, eco-friendly and easy to be handled with the help of Intelligent Information Assisted communication to move further.

3. Intelligent information assisted communication transportation framework

II-CTF aims broadly at addressing problems such as road safety and traffic management through the avoidance of accidents and traffic congestions. Traffic assessment and management where some research work focuses on traffic information systems based on II-CTF, whereas other centralized solutions focus on traffic evaluation and hazard recognition centers. The Framework aims at delivering social, energy, and economic benefits through the intelligent information-assisted transmission. The use of different forms of communication and information technology are used for the II-CTF. Various II-CTF studies on traffic and road problems have been carried out in recent years, improving transport is one of the most important features of II-CTF. Intelligent transport systems perform functions, including information collection, information processing, information integration, and real-time results. Increased coordination and smart operation of II-CTF provides access to end-users in all kinds of scenarios, such as water, rail or air.

A useful technique is used to implement an intelligent system with an efficient communication support system for interactions, which is used, and better empirical results are shown. Several tools and methods have been applied, and experts around the world have helped to develop the intelligent traffic management program. Regardless of the rise in cars, congestion in emissions and traffic may not affect the transportation system. As stated, accurate and suitable measurements are the key factors in the transport system, because knowledge of journey paths is crucial for transport system success. Figure 2 displays a conceptual model for intelligent transport. The most common definitions are to calculate the difference from the center of the road or to detect notable signals on the steering wheel angle. Driver modeling methods that attempt to accurately analyze cognitive processes of drivers in semi-automated vehicles to determine the impact on operator workload, behavior, and safety of future driver assistant systems A is expressed in the following Equation (1):

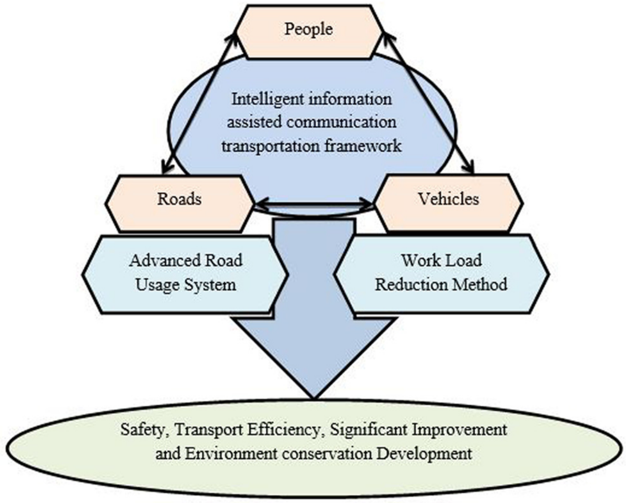

Figure 2. II-CTF conceptual model

$$A = \sum_{h=1}^{h} \sum_{y \ni E_h} b^2 \tag{1}$$

H determines the operator workload, E is the parameter to detect the notable signals during the process of driving, b is the center road point, and n is the cognitive process of the automated vehicle. Thus to minimize the distance between the notable signals and the center road point the above equation is solved in the following Equation (2):

$$b^2 \ (Y * n_h) = \sum_{m=1}^{M} \left(Y_m - n_h \right)^2 \tag{2}$$

M denotes the distance between notable signals and central road points. Thus, the energy is consumed, and the data reliability is improved through enhancing traffic and transportation management. Enhanced capacity management can facilitate security; as poor management can enhance unreliability. With better incident management, and with proper scheduling and maintenance publication, infrastructure management can improve reliability. More or less independently of transport policies, security policies have been developed. In the past, many safeguards seem to be restrictive, especially for pedestrians and cyclists. Smooth car traffic is prioritized. Pedestrians and bike travelers have been obliged to abandon space and freedom and are still vulnerable when they travel along the road. In the upcoming section, using machine learning assistance, optimal routes are predicted based on movement patterns, vehicle categorization that helps to minimize traffic congestion.

3.1 Machine learning algorithm to minimize traffic congestion

Rapid urban developments, combined with increasing car popularity, have contributed to the severe congestion of urban traffic. Rapidly, it increased the interest of researchers in the investigation of smart transport, particularly in the area of transportation to save the human life. Researchers have attached more importance to traffic forecasting with the extensive study of II-CTF in recent years. The traffic forecasting has become one of the main traffic engineering research topics. In particular, highly complex road traffic, random and unsafe road transport. Neural networks are therefore considered to have the ability to learn complex non-linear systems for prediction of the traffic. The conventional neural network solves the complex and nonlinear problems of traffic predictions and handles a large amount of input information, the sophistication of the model, the slow speed of workouts, and easiness to fall into the ideal local environment. However, in the area of traffic prediction, large-scale use of neural networks is inhibited. The gradient machine learning GML approach provides many advantages, including the quick training speed, the unique, optimized solution, and the preservation of the learning skills of complex non-linear systems. The GML is a new learning mechanism using a single hidden layer feed-forward neural network. The GML algorithm is, therefore, appropriate for the large volume of data and the complexity of traffic forecasts.

GL algorithm is designed to meet the above challenges shown in Figure 3 is proposed to adjust the parameters of the simulator such that the simulated trajectories can match the real data with sparse monitoring. The GL algorithm avoids a frustrating trial-and-error manual setup of the simulator. Simulator parameter tuning can naturally be regarded as a sequential decision process where states are stimulatory environment pictures, and behavior is all possible ways to set parameters. Policy measures that continuously follow positive steps to modify simulator parameters in each move are taught. Figure 3 shows the GL framework for the state description of the real-life functional vector extracted from a simulator. To approximate A-value, a two-layer is built, a fully connected neural network for GL. The weights of the neural network are optimized iteratively during the training process. To reduce the discrepancy between the optimal Value and the anticipated one using a gradient of the loss function. Many existing methods of deep enhancement learning use real-valued state vectors. Because the number of vehicles on the roads describes the distribution of the transport volume directly, developers first obtain the values from modeling simulation. The next step is to achieve average travel time and speed as the frequency and time of traffic is closely associated with the traffic volume. Developers obtain the average

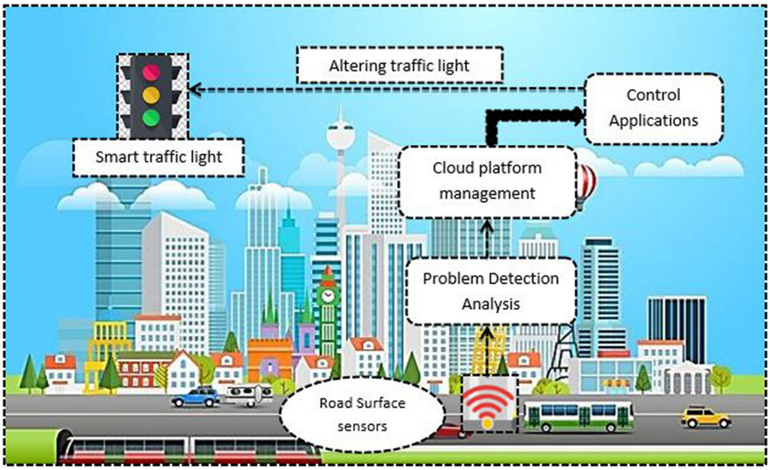

Figure 3.
Gradient learning architecture for tuning the speed of the vehicles

waiting time that measures the average stop time in the immediate simulation step of each vehicle is expressed in the following equation (3)

$$\text{A}\ (\text{x},\ \text{y}) = \sum_{\rho_{j\ni\nabla}}\sum_{q_{j,i\ni\rho}} f_{j,i}^{simulation} - f_{j,i}/\left(\sum_{\rho_{j\ni\nabla}}\sum_{q_{j,i\ni\rho}} 1\right) \tag{3}$$

$f_{j,i}^{simulation}$ is the relative time interval, $q_{j,i}$ denotes the simulation of the vehicle and $f_{j,i}$ is the arrival time. Acceleration of a vehicle can be done at any time; the acceleration results cannot be checked until the vehicle arrives at the next monitoring stage. Furthermore, the change in a vehicle speed will affect other vehicles' speed denoted in the following equation (4)

$$\left(\text{A}\ (\text{x},\ \text{y}) = \ \text{D}\sum_{j=1}^{\infty} \delta^{j-1} T_j | X_0\ = \text{x},\ B_0 = \text{y}, \delta\right) \tag{4}$$

δ denotes the future reward discount factor, x_j is the state and y_j is the action. T_j is the policy taken in each step, gradient learning aims to make the best use of the sequential process to accumulate future rewards. Positive or negative environmental benefits are given through intervention by the organization during gradient learning. The agent will use the bonus to determine the best A-value and optimize the neural network parameters using the uncertainty of the Bellman equation followed in equation (5):

$$\text{T} \ = \ \sum_{u\in\sigma} d^{-\left(f_{\sigma}^{simulation} - f_{\sigma}\right)} \tag{5}$$

σ Denotes the vehicle arrived at the point, $f_{\sigma}^{simulation} - f_{\sigma}$ is the arrival and the simulated time of the vehicle. There are fewer absolute time variations when and when more vehicles are strongly obtained, and under these circumstances, the agent can receive greater rewards. A two-layer neural network is initialized and trained to estimate the A-value, which lasts for one minute. Network dimensions are updated by gradient descent every step, using the difference between A values determined and the feedback from the stimulating environment. The gradient learning algorithm holds a sampling of miniatures from the replay memory and updates network weights by minimizing the following loss function in each simulation step expressed in the following equation (6):

$$\text{A}\ (\tau)\ = D_{x,y}\left[\left(A^{*} - \text{A}(\text{x},\ \text{y}; \tau)\right)^{2}\right] \tag{6}$$

A(x, y;τ) is the optimal target value, τ is the decay term gives future penalty rewards. Loss function estimation is explained in the above Figure 4; the goals of the miniatures are determined. Human beings follow a selfish policy for managing the relationship between exploitation and discovery. This implies that a random action, instead of an optimum, is selected with a probability τ, for analysis during preparation. The complete training of the gradient learning architecture is provided for these retrieved trajectories, which are denoted by the missing real and incomplete value of paths using the traffic volume values in the simulator represent a more extensive range of vehicle categorizing to minimize the traffic congestion. Thus, Scheduling Traffic Optimization helps to reduce the energy and many challenges faced by traffic managers in terms of optimization of the route and environmental impact due to massive traffic collision.

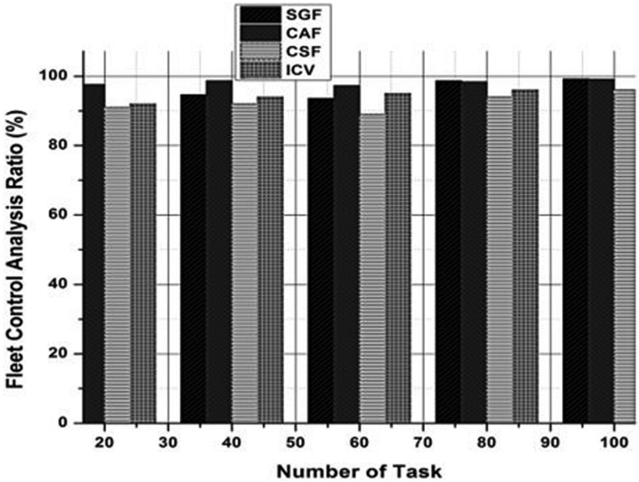

Figure 4.

3.2 Scheduling traffic optimization

The rapidly deteriorating environment has been a growing concern in recent years in terms of air, water, and noise pollution in the urban areas of this country. Car traffic is found to be a critical factor in urban environmental damage, especially as far as air pollution is concerned. There has been a substantial effort to reduce emissions from vehicles by ensuring that new cars be fitted with air emission control systems. Besides, successful traffic engineering interventions will accomplish a significant part of the air pollution control strategy. It is therefore critical that the decision on transport engineering be taken on not just the basis of cost savings, increased safety, and better traffic efficiency, and on factors such as lower energy demand and improved environmental quality. Automotive air pollution is primarily made up of carbon monoxide, nitrogen oxides, hydrocarbons, pipes, suspended particulates, and other sulfur oxides. Sulfur dioxide affects the upper airway and reduces the transfer of gas in the region where the alveolar sac has occurred. The oxidants produced by the hydrocarbons' reaction to a nitrogen oxide can be harmful to crops and plants, as well as irritating skin, throats, and lungs. The total particulates suspended are the contaminants that pollute the ground: men, clothing, cars, houses, regional offices, and shops. Some control initiatives proved counter-productive; however, sense that although some of the contaminants are decreased, they may have contributed to a rise in other contaminants and even to public safety threats.

With the rising energy issue, it becomes imperative for an advisable strategy to regulate air pollution to reduce emission rates without severely impacting the energy efficiency of cars using road surface sensors shown in Figure 5. Where it is technically or economically feasible to control motor air pollution immediately at the source, there should be an improvement in the traffic management program or better road planning and planning. Regulating land use to obtain indirect sources that control substantial volumes of motor vehicles and help degrade a city's air quality. According to the Clean Air Act, steps have been taken to meet that objective, and, to solve this problem of clean air, the Environmental Protection Agency recognizes the importance of traffic management and the need to

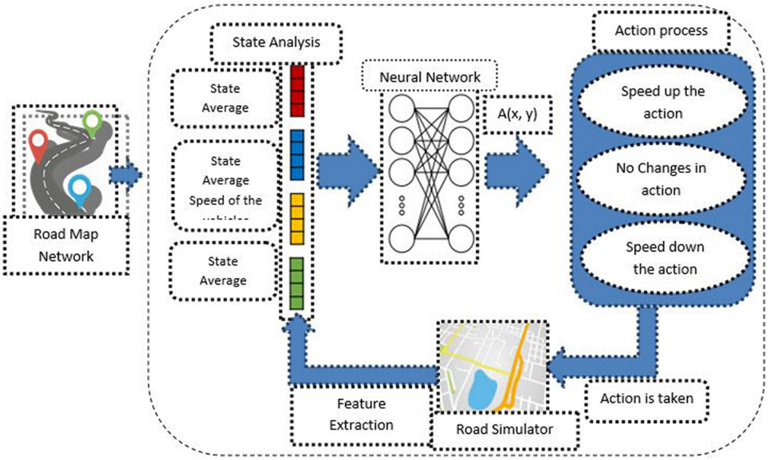

Figure 5.
Traffic optimization technique to control pollution

regulate indirect sources. Different factors influence the volume of air pollution in a car-induced region, including the use of ground and the historic concentration of pollutants, as regards the location, height and arrangement of road networks; wind speed and traffic; environmental and weather and other aspects of the building concerning the route network. The volume, speed, vehicle mix of the traffic stream, and the type of vehicle operation A (x, y) are the main elements in terms of traffic factors expressed in the following Equation (7)

$$\mathrm{A}\ (\mathrm{x},\ \mathrm{y}) = \frac{1}{K(\vartheta)} \boldsymbol{e}^{-\boldsymbol{i}A^{*} - \mathrm{A}(\mathrm{x},\,\mathrm{y};\tau)} \tag{7}$$

$K(\vartheta)$ is the volume of the traffic stream, $\mathbf{i}A^{*}$ is the speed of the vehicle is expressed as the factors of the traffic stream. At a certain level of traffic D, the sum of contaminants increases directly in relation to the volume expressed in the following Equation (8):

$$\mathrm{A}\ (\mathrm{x},\ \mathrm{y}) = -\sum_{x,y \ni D} \boldsymbol{e}^{-\boldsymbol{i}A^{*} - \mathrm{A}(\mathrm{x},\,\mathrm{y};\tau)} \tag{8}$$

The concentrations of carbon monoxide near an urban artery are identified at different volume-capacity levels; the carbon monoxide level rises with a decrease in the traffic level of service. Auto exhaust emissions vary with velocity. Such values can be calibrated for different average traffic speeds. Air quality in metropolitan areas can be significantly enhanced with both long-term and short-term initiatives, long-term planning action involving proper land use arrangements will ensure that urban activities are appropriately allocated. Efficient action on streets and buildings should be taken to reduce the air pollution effects under the area-wide land use planning. Long-term planning on land use will enable transport systems to be developed to significantly reduce the number of vehicles and the length of journeys, thereby limiting the impact of air contamination. To improve air quality, in addition to the long-range programs which can be applied for new developments, several short- and intermediate-range traffic engineering measures can be taken in existing municipalities. In terms of increased flow rate and less air pollution due to vehicle emissions, the performance of the traffic management system would greatly benefit. The average traffic miles have increased significantly, and, at the same time, the total car hours have been reduced, with higher speeds, fewer delays and congestion, and lower carbon emissions. The efficient traffic management systems, which reduce traffic congestion and delay in a road network and thus reduce the stop-and-go service, which accounts for a large part of vehicle emissions, can considerably improve urban air quality.

4. Results analysis and discussion

This area of research aims primarily to take all measures necessary to integrate vehicles into the Internet to ensure architecturally that the II-CTF concept is realized. Design and development of II-CTF functional and system architecture that enhance the operational efficiency of connected Internet vehicles and adapt the system architecture to meet the needs of a framework that implements autonomous decision-making techniques.

Smart transport systems are innovative technology used for cars, facilities, and operating systems that make cars smart, as shown in Figure 6. With the II-CTF technologies used throughout transportation and logistics in several industries, demand for these systems is increasing rapidly. Whereas the need for II-CTF is growing in these applications worldwide, many companies have trouble keeping the final product's prices low, which leads to a slow market penetration due to the high cost of such systems. In the intelligent transport system market, roadways are the rapidly expanding sector. The rising number of company fleets worldwide is pushing many logistics players towards proper asset tracking and management systems due to increased e-commerce activities and manufacturing activities.

It is a crosscutting field that involves many of the technologies used to build smart transport systems shown in Figure 7. At present, the solutions being introduced concentrate on vehicles or drivers themselves, as a strong network of linked sensor-proof roads is not yet available. To maximize the resource used at a time when logistics is no longer a rigid, firm environment, an area open to the complex changes in the transport of goods and people. It is essential to know vehicles' conditions, their location, and other load transport parameters, such as temperature and weight. Capabilities that can be implemented in logistics companies using technology are capable of optimization of routes to avoid difficult areas within the transportation network, or of managing the fleet movement with intermodal nodes to reduce time to transition between modes of transport.

A specific section is given to car park issues; many tasks, mainly in cities, are to be performed in the car parking regulations with different outcomes. As shown in Figure 8, the technology currently produces exciting initiatives, most of which have a significant technological background and are in a smart city context. Parking problems are relevant in relation to the transport of goods as the time required for a lorry or car to park should be included in the tachygraphy' driving time. The amount of time spent in the search for the right place is not always accurately measurable, depending on the point of arrival or how

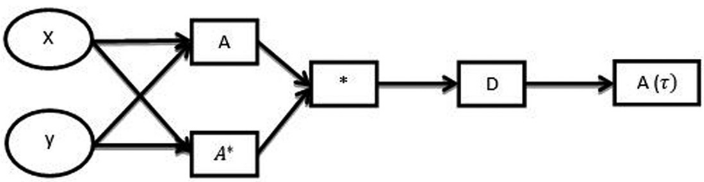

Figure 6.
Intelligent transport, growing sector analysis

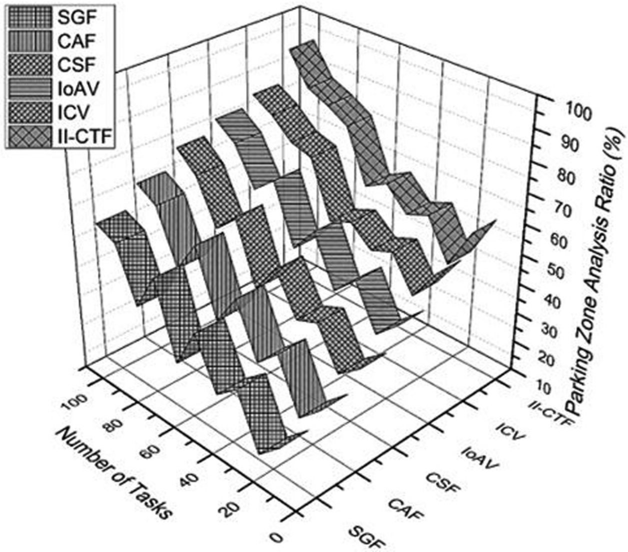

Figure 7.
Fleet control analysis

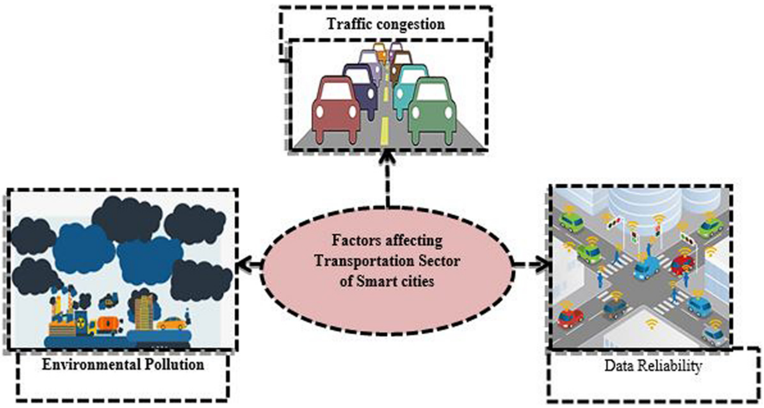

Figure 8.
Parking zones analysis

many times the driver stops, which could not even mean compliance with regulations or unbalancing time limits previously assigned to transport. On the urban level, goods logistics requires manufacturing control of parking space for the loading and unloading of bulk vehicles by hand. Certain places are reserved, not efficiently, and rigidly. The progressive implementation of electric mobility will include battery charging points and energy tariff systems, making parking space adaptable for battery-recharge infrastructure needs.

Reducing the environmental impact is a significant problem in terms of sustainability, as shown in Figure 9. II-CTF is important for vehicle usage optimization, and industrial vehicles often need the optimization of available resources: the flexibility of routes allows the emission of CO2 to be reduced, as well as fuel-saving and reduction of the number of hours traveled. Proper intermodal management, traffic management, or climate conditions

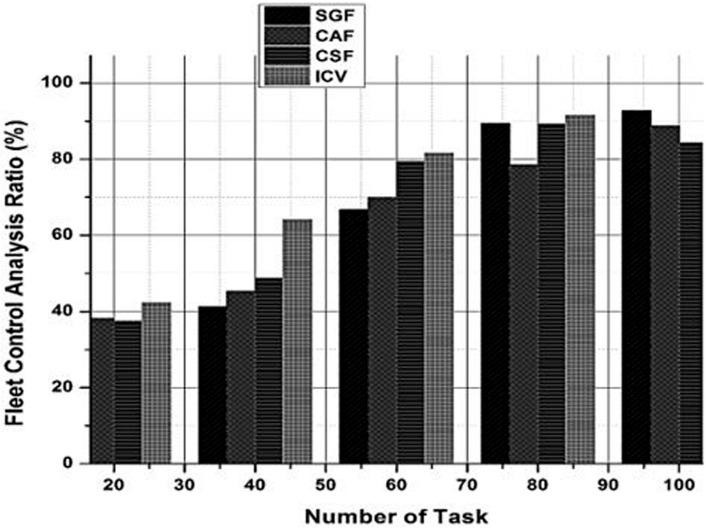

Figure 9.
Safety & sustainability analysis

allow for dynamic decision-making in accordance with the terms specified. Even applications that are installed on mobile devices are fleet management systems capable of evaluating the driving habits of both private and professional people. It helps the advice or state to boost performance, prevent breached speed limits, or even personalized consumer insurance policies. The decrease of car crashes, as for the integrity of people and of goods and vehicles, is another essential element. There is still much to be done on the ground, for example, about intelligent roads and connected cars. Automated driver control vehicles by different famous companies are even being built; however, a long way ahead of time will be used widely.

There are several hybrid and electric cars seen on highways, and often-private vehicles for the residential sector. From a technical point of view, as shown in Table 1, as long as they are not used in the city or the suburbs, electric transmitters and low-tonnage cars can already be run. The biggest issue with the use of electric motors in long-haul transport is the lack of proper charging points on motorways because then road planning can be practical. The induction is charging devices being used for selection applied to the roads to charge the battery during movement of the vehicle. Substantial investments are required for this approach, and the coordination of several actors is needed to give life to it: manufacturers, governments, and users should stand up for this type of technology collectively.

It will be reasonably easy to gain an extent in which circular references are obtained between various elements when you examine certain aspects involved in defining the Smart

Table 1.
Analysis of electric and hybrid vehicles

No. of Tasks	SGF	CAF	CSF	IoAV	ICV	II-CTF
10	37.4	38.1	37.4	39.9	40.1	42.3
20	41.2	45.3	48.8	65.8	57.4	64.1
30	66.7	69.9	79.3	79.9	85.1	81.5
40	89.3	78.5	89.2	89.4	90.2	91.5
50	92.7	88.7	84.2	91.2	93.2	97.8

City, as shown in Table 2. There are two of them, travel and mobility. Mobility and transport are key pillars in the definition of urban areas from the perspective of the intelligent cities. From a transport point of view – smart traffic networks, specifically – smart cities, as can be seen in the programs at many renowned ITS activities in the coming months, are distinct entity that should be managed by itself. Convergence is a mechanism that stands out. Sooner or later, convergence will put together all that incorporates technical and physical approaches, networking, and activities, including enterprise solutions incorporation into the network.

All the data used by the city are incredibly essential and must be safe, as shown in the above Figure 10. The information is sensitive and vital and cannot be revealed to all residents in relation to either local authorities or sectorial information such as hospitals or personal and technical data of particular people. To ensure the existence and dissemination of these data, encryption techniques, privacy policy, authentication, and access control must be developed. An intelligent city network needs to be scalable and versatile. In particular, if changes arise, it should be able to adapt effectively and modify its actions in new

No. of tasks	SGF	CAF	CSF	IoAV	ICV	II-CTF
10	34.4	36.1	36.4	38.5	39.1	44.3
20	39.2	42.2	48.8	65.8	57.4	64.1
30	66.7	69.7	79.2	81.9	84.5	87.6
40	86.3	78.4	89.2	89.3	90.2	92.5
50	94.7	88.7	85.2	90.2	93.2	98.8

Table 2. Convergence analysis

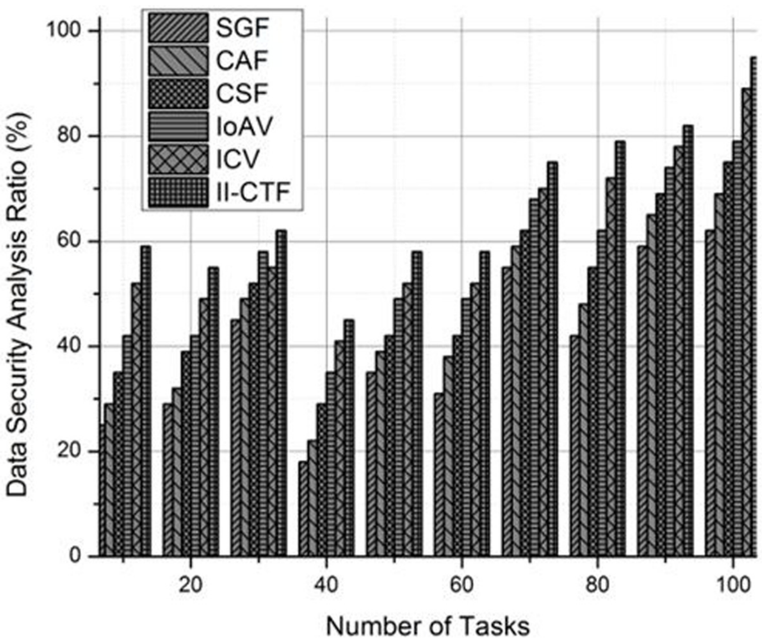

Figure 10. Data security analysis

circumstances. It should be able to recover, upgrade, and, if necessary, generate new and more advanced operations immediately after a transition. The system must employ sensing mechanisms, prediction techniques and data extraction to satisfy this requirement.

5. Conclusion and future scope

Energy and smart management of transportation in metro cities are essential tasks because of the rapid urbanization. This paper provides an overview of energy management in smart cities, and then how smart information assisted communication transportation framework helps to create a green environment in smart cities. Energy management has been divided into two levels: transportation data reliability and environmental impact management. Authors cover different approaches to the security of data in transport and environmental impacts in smart cities. Such campaigns aim to recognize innovative programs, software, and even products that concentrate on particular areas of human interest and address issues that promote people’s everyday work. Intelligent transport systems are the cornerstone of many research trials around the world and field, which attracts interest that is more significant ever has been considered as the limitation. The II-CTF definition is supposed to attempt to overcome some of the problems of the transportation environment that pose difficulties and make the carriage simpler, safer, more efficient, and green for all. The advantage of energy management for intelligent cities, simulation results are presented. Potential future energy guidance start city management is as follows: energy efficiency and security complexity. Protocols are crucial for their practical implementation, and it is, therefore, important to examine robust energy restraint security protocols.

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