Project Information			
Project Title	**Department/Faculty/University**	**Project Field/Discipline**	**عنوان المشروع باللغة العربية:**
Automotive Embedded Autonomous Applications	Computer and System Engineering Department. • Faculty of Engineering • Ain Shams University	• Embedded Systems • Deep Learning	تطبيقات مدمجة للسيارات الذاتية القيادة
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Motivation

Please write why you chose this project idea, explaining clearly
(i) Problem definition, (ii) approach and tools/techniques, and (iii) overview of system modules.

(i) An autonomous car is a vehicle that can guide itself without human conduction fulfilling the human transportation capabilities of a traditional vehicle. Our greatest challenge is to implement a prototype of a driverless vehicle that can move between two given points on the best route using a GPS system, avoiding all obstacles on road using an object detection/recognition system based on deep learning.

(ii) Dividing the project into two main tracks, a Deep Learning track and an Embedded System/Control track.

1- in the embedded system track:

a) we will buy the car and get the tx2 jetson kit from IGP...then we will define the motion functions to control the car with the kit

b) design digital control system to control the car to move autonomously while avoiding collision according to the state of the car and the environment information which comes from the deep learning output

b) we will get some sensors like the lidar sensor and the mono camera from IGP...then define the functions of interaction between them and the kit

2- in the deep learning track:

a) study neural networks and deep learning

b) study end-to-end approach

c)train a model with training sets which are suitable for our approach

3- the integration track:

a) integrate the work of both teams

b) develop the project to run with GPS module from point to point

c)test and re-integrate

iii)

- a car with its driving system
- a computer vision system (like the camera and the lidar)
- deep learning modules (including lane and object detection and also end-to-end approach)
- tracking module (using the GPS module)
- a controlling system

فيما لا يزيد عن 200 كلمة أكتب وصف عن المشروع باللغة العربية:

نموذج لسيارة ذاتية القيادة بمقياس 1:10.تعتمد السيارة بشكل اساسي علي كاميرا واحدة تسجل مجموعة من الصور الخاصة بالطريق ثم تقوم بتحليلها واتخاذ القرار المناسب بناء علي هذا التحليل متخذة نهج ال end to end ثم استخدام الGPS للتحكم في العربية لتتحرك من نقطة لنقطة بدون تدخل الانسان.

Why do you think your project should be funded? In which the applicants write in a few lines where the help statement should be "Explain in no more than 3 lines the new and innovative aspects in your project that make it worthy of funding

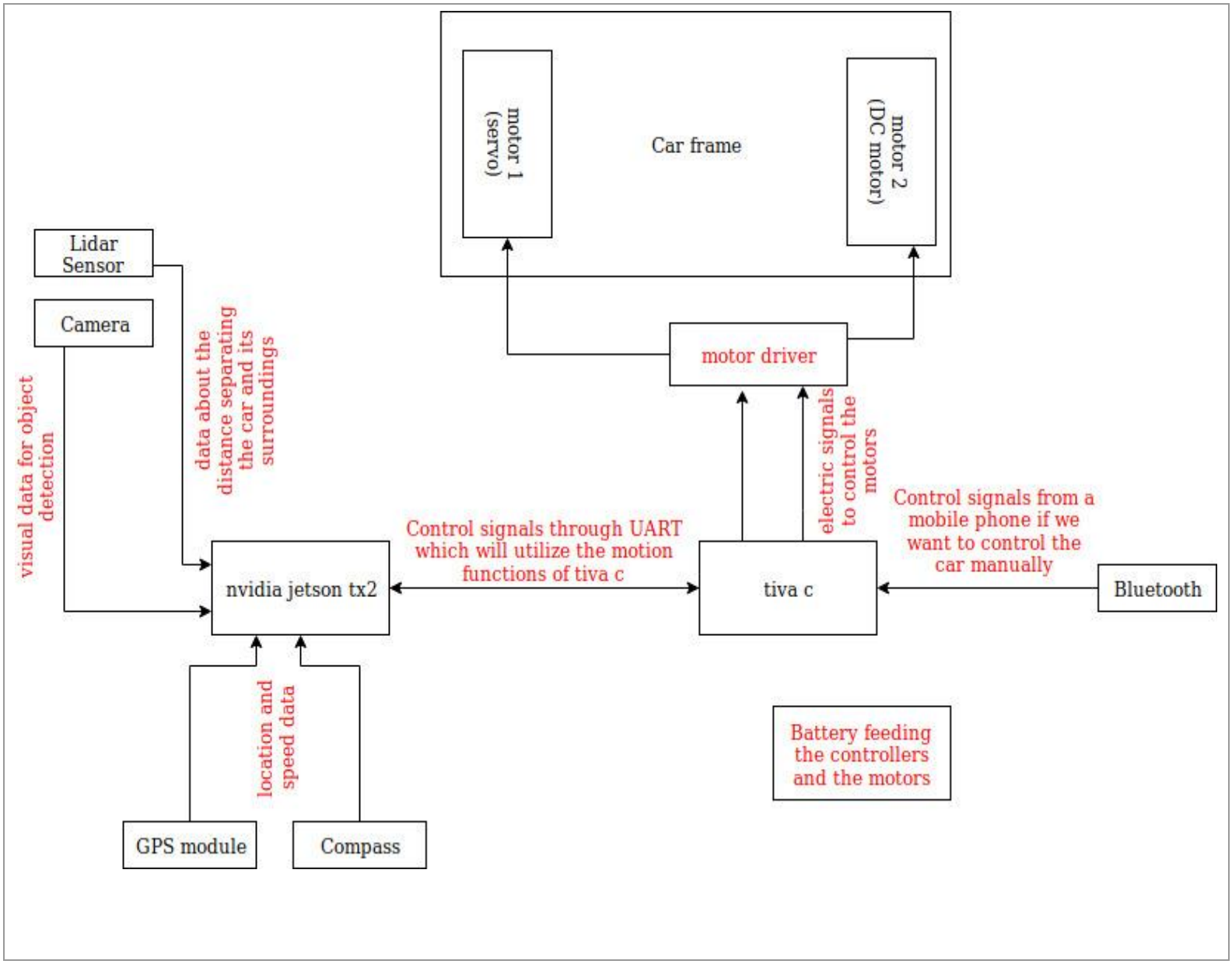
As it will establish a base for the future of the self-driving car field and will be considered the one of the basic steps in the research field that many future developments can be dependent upon till reaching the level of the abroad researches or exceed it.

." What is its impact on community/market/end user/…?

The main aim of science is to make people's life easier and this project will be considered the base on which a huge industry of vehicle transportation relay and the self-driving cars will strongly help in the prosperity of the market and the economy and help in making people's life easier which will help in the prosperity of the society.

Block Diagram

Please insert the project detailed block diagram below, (Please highlight the parts that will be implemented in different colors than the parts that will be purchased)



Prototype Description and Specifications
Include a clear description of how the prototype will operate, explaining a scenario/use case of the operation. Also, include the performance metrics you target in the prototype.
The car will be able to move autonomously in a specific route inside faculty of engineering Ain Shams University without hitting any object till reaching its destination while object detection and also responding to different objects in a different way.
What are the project's deliverables?

- **A prototype of an autonomous car with Convolutional Neural Network (CNN) which moves according to end-to-end approach**
  - **a car trained to map raw pixels from a single front-facing camera directly to steering commands.**
  - **a car moving from one point to the other using a GPS module.**

Please define the approach and phases to deliver the intended project outcome

1- end-to-end self driving approach
Phases:
- **learning phase**
- **car building phase**
- **model training phase**
- **integration phase**

2- general self driving car
Phases:
- **learning phase**
- **digital control phase**
- **model training phase**
- **integration phase**

Do you foresee any potential marketing or customers?

yes

Do you foresee creating a startup based on the outputs of this project?

yes

Have you participated as a team in any competition?
If so, which one? And what was your achievement?

not yet.

Role of the Industrial Partner (if any)

What is the type of support to be provided by the industrial partner (technical, financial, access…)?

providing training sessions, providing software and hardware tools, providing labs, providing needed components and

providing financial support.

Prototype Prospects
List the Egyptian ICT companies that may be interested in the developed prototype and the end-users/customers (name the specific class of individuals, governmental agencies, ministries … etc. that will benefit from the prototype)
Valeo **Mentor Graphics** **Avelabs** **BMW** **Mercedes** **EJAD** **Brightskies**

Project Budget

Item	Type (Hardware/ Software/ Other)	Part in the Block Diagram	Possible Provider/ Merchant	Specifications	Quantity	Price in EGP
nvidia jetson tx2 kit	hardware		https://www.amazon.com/NVIDIA-945-82771-0000-000-Jetson-TX2-Development/dp/B06XPFH939?crid=7PMNRKAZHU5J&keywords=nvidia+jetson+tx2+development+kit&qid=1540736667&sprefix=nvidia+jet%2Caps%2C306&sr=8-1-fkmrnull&ref=sr_1_fkmrnull_1			10000-12000
Traxxas car scale 1:10	hardware		https://www.amazon.com/Traxxas-Slash-Brushless-Course-Platinum/dp/B00A0KQH84			8000-10000
lidar sensor	hardware		https://www.robotshop.com/en/rplidar-a2m8-360-laser-scanner.html?fbclid=IwAR0MPnl2FMR6SpR3aXD7TNqCwT0YgcWJmYgkcS_7qGS6FagzeE0-pGgQWJw			5400-6400
mono camera	hardware		https://www.robotshop.com/en/pixy-cmucam5-image-sensor.html			1000-1200
GPS module	hardware		https://www.robotshop.com/en/freetronics-gps-module.html			900-1200
Compass	hardware		https://www.robotshop.com/en/phidgetspatial-precision-3-33-high-res-3-axis-compassgyroscopeaccelerometer.html			2800-3500

bluetooth module	hardware					
battery	hardware			depends on the used parts		depends on the used parts
motor driver	hardware		https://www.robotshop.com/en/2x7a-dc-motor-driver-module.html			100-200
Grand Total						about 30000