Performance Task: Explore - Impact of Computing Innovations Written Responses

Entire Project

Computational Artifact

AP Computer Science Principles Create Performance Task

AP-Computer-Science-Principles-Performance-Tasks-Repository

2a. *Provide information on your computing innovation and computational artifact* ***(see attached PDF)****. Name the computing innovation that is represented by your computational artifact. Describe the computing innovation's intended purpose and function. Describe how your computational artifact illustrates, represents, or explains the computing innovation's intended purpose, its function, or its effect.* As denoted in my computational artifact, autonomous technology is intended to facilitate and accelerate traveling, reduce vehicular collisions and congestion, maximize the user's time, improve land use, increase fuel efficiency, increase mobility for the disabled and elderly, and ultimately, preserve lives. In addition, my Artifact depicted how autonomous vehicles operate and potential reparations (e.g., the diminishing of public transit, crash repair, and automobile insurance companies, inability to function in certain conditions, etc.) of the technology—please refer to my Computational Artifact for further elaboration.

2b. *Describe your development process, explicitly identifying the computing tools and techniques you used to create your artifact. Your description must be detailed enough so that a person unfamiliar with those tools and techniques will understand your process.* I developed my computational artifact in Microsoft Powerpoint, and following the creation process, I saved my artifact as a PDF for submission. Regarding Powerpoint, I downloaded and inserted the logos of several companies involved in the autonomous vehicle industry into the Powerpoint presentation, delineating benefits and detriments of the innovation. In order to save a file as a PDF from Powerpoint, you must:

1. click the *File* button,
2. click the "Save As" key,
3. select your desired storage folder,
4. click the drop-down menu located under the name of the file and select your desired file type,
5. click the save button.

Computing Innovation

2c. *Explain at least one beneficial effect and at least one harmful effect the computing innovation has had, or has the potential to have, on society, economy, or culture.* Autonomous technology has the potential to facilitate and accelerate traveling, reduce vehicular collisions and congestion, maximize the user's time, improve land use, increase fuel efficiency, increase mobility for the disabled and elderly, and ultimately, preserve lives. According to the Association for Safe

International Road Travel, approximately 1.3 million people die annually as a result of car accidents. Theoretically, if these deaths to had been prevented, icons, such as Paul Walker and Princess Diana could still be alive.

However, it is possible autonomous vehicle technology may diminish the need for public transit, collision repair, and automobile insurance companies as their services could become obsolete. Further, the innovation still contains flaws (e.g., inability to function in fog, the absence of Lidar data—please refer to my interview with David Paz for elucidation—or a non-sunny day, mixed signals, passivity, etc.) and necessitates additional research, as evidenced by the fatal crashing of Joshua Brown's Tesla Model X SUV that was operating on autopilot.

2d. *Using specific details, describe: the data your innovation uses; how the innovation consumes (as input), produces (as output), and/or transforms data; and at least one data storage concern data privacy concern, or data security concern directly related to the computing innovation.*

Autonomous technology is comprised of nine key components that analyze a spectrum of data—GPS, tachometers, altimeters, gyroscopes, Lidar (light detection and ranging via lasers) technology, video cameras, ultrasonic sensors, a central computer module, and radar sensors. Depending on the manufacturer of the vehicle, entailed aspects and prices may vary.

Signals from GPS (i.e., global positioning system) satellites are combined with outputs from tachometers, altimeters, and gyroscopes to create a more accurate positioning system—potentially a one to two centimeter proximity accuracy—versus standard GPS, which has a three to four meter precision.

Lidar sensors refract pulses of light off their surroundings, and the data generated by this process is utilized to identify lane markings and the edges of roads.

Video cameras detect traffic lights, road signs, other vehicles, pedestrians, and obstacles and transmit these data to a central computer where it is analyzed and filtered in with the response of the vehicle.

Radar sensors monitor the position of other vehicles nearby, and these sensors have already been implemented into various adaptive cruise control systems.

Ultrasonic sensors measure the position of objects close to the vehicle, such as curbs and other vehicles.

The information accumulated from all the sensors is analyzed by a central computer that manipulates the steering, acceleration, and brakes of the vehicle.

According to Intel, GPS, tachometers, altimeters, and gyroscopes generate approximately 50 kilobytes per second, Lidar sensors generate approximately 10 to 70 megabytes per second, video cameras generate approximately 20 to 40 megabytes per second, and ultrasonic sensors

and radar sensors generate 10 to 100 kilobytes per second. The accumulation of all that data culminates to approximately 4,000 gigabytes per hour.

Engineers of these vehicles still ponder the importance of such exorbitant amounts of data and what their course of action will be regarding the storing of that data. In addition, as with all computers, self-driving cars can be hacked, as they possess satellite and external connections.

References

2e. *Provide a list of at least three online or print sources used to create your computational artifact and/or support your responses through in-text citation to the prompts provided in this performance task.*

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