Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2024

Digital Society

Higher and standard level

Paper 2

11 pages

1. With reference to Source A, identify **two** characteristics of a global positioning system (GPS). **[2]**

Answers may include:

- Location/Used to determine/track the geographic location of something anywhere in the world.
- Requires satellites/uses network of satellites.
- Requires a GPS receiving device.
- Satellites are constantly sending out radio signals.
- Signals send out a timestamp, position of satellite, ephemeris (precise orbital information for the satellite).
- Uses radio waves as these travel at a constant speed.
- GPS receivers are programmed to receive information about where each satellite is at any given moment.
- A GPS receiver calculates its position by precise timing of the signals sent by GPS satellites/uses transit time of each signal to compute the distance to each satellite.
- Uses the method of trilateration (accept triangulation).
- Position information includes: the longitude, latitude, altitude at a precise time.
- Location accuracy can be within one centimeter.

*Award **[1]** for each characteristic of a global positioning system up **[2]**.*

2. With reference to Source B, suggest **two** reasons why some parts of the world have more Google Street View coverage than others. **[4]**

Answers may include:

- Population Density
- Google focuses on areas with lots of people for Street View coverage.
- More people mean more users, which makes it worthwhile for Google to invest in capturing imagery in these places.

- Technical Factors
- Some areas have limited access to technical resources to use SVI (such as Internet)
- It may not be worthwhile for Google to invest in capturing images in these places as lack of access to Internet make the use of SVI impossible for users.

- Economic Factors
- Google prefers wealthier regions with good infrastructure for Street View coverage.
- These areas offer better returns on investment and easier operations for Google.

- Accessibility and Infrastructure
- Google chooses areas with good roads and easy access for Street View vehicles.
- It's cheaper and safer for Google to capture Street View imagery in these places.

- Regulatory Environment/Government acceptance
- Google deals with rules and permissions from local authorities/governments for Street View operations.
- Tough regulations can slow down or limit Google's coverage expansion.

- Geopolitical Considerations
- Political stability and relations affect where Google can operate Street View.
- Government restrictions can impact coverage in certain regions.

- Topography and Geography
- Challenging terrain can make it hard to capture Street View imagery.
- Tough terrain limits access for Street View vehicles, affecting coverage.

- Cultural Sensitivity
- Google avoids areas with cultural or security issues for Street View.
- Cultural concerns or security risks can limit coverage expansion.

- Commercial Interests
- Google prioritizes areas with business opportunities for Street View coverage.
- Google wants to make money, so it focuses on places with commercial potential.

- Community Requests and Feedback
- Google listens to user requests for Street View coverage.
- Areas with high demand from users get priority for coverage expansion.

*Award **[1]** for identifying a reason why some regions have limited Google Street View coverage and **[1]** for an elaboration up **[2]**.*

*Mark as **[2]** + **[2]***

3. Compare and contrast what Source C **and** Source D reveal about the impacts and implications for citizens arising from the use of street view imagery (SVI) applications. **[6]**

Answers may include:
To meet the demands of the question, the response should focus on impacts (effects and outcomes) and implications (opportunities and risks) for ***citizens****.*

Crime prevention vs crime enabling

- Source C focuses on crime prevention (e.g., safer environment for citizens) **whereas Source D** focuses on both crime prevention (e.g., blurring) and crime enabling implications.

Privacy

- Both sources reveal that details in images have been or can be blurred out to protect privacy of citizens
- Source C shows automated blurring of people's faces and number plates in photos prior to publication whereas Source D shows automated blurring of number plates and owner requested blurring of homes after publication
- Both sources address problems with blurring - Automated blurring this may still leave identifying data/features (Source C reveals man was identified) and Source D suggests that blurring can attract criminals
- Location is not private (both sources reveal timestamps and locations.

Responsibility for de-identification

- Source D reveals request for de-identification of property is required by citizens after images are live whereas it is implied that blurring of faces and number plates takes place before images are live (Source C and Source D).

Surveillance

- Both Source C and Source D suggests that GSV can be used as a surveillance tool as the images are timestamped (to the month and year). Despite blurring, there are other 'clues' that could lead to individuals being identified from images for example posture, clothing, van in background (Source C). Additionally, houses that are blurred may draw attention to others (Source D).

Marking Notes:

- *Sources do not have to explicitly signpost the source as it is implicit in the response.*
- *The question asks for impacts (effects and outcomes) and implications (opportunities and risks).*

The following markbands should be used with responses to question 3.

Marks	Level Descriptor
0 marks	• The response does not reach a standard described by the descriptors below.
1-2 marks	• The advantages/disadvantages or specific points from each source for specific individuals are identified. • The comparison/contrasts of points/ideas drawn from C and D about the SVI application then move to a 2. (whereas, while…)
3-4 marks	• The impacts (effects and outcomes) and implications (opportunities and risks) for citizens must be stated. • Comparisons and contrasts are linked to the impacts and implications on various citizens mentioned in the sources, such as the police, criminals, passers-by, and homeowners. (therefore…) • The reference to the sources may be implicit.
5-6 marks	• The impacts and implications are further developed from the examples provided in Sources C and D to explore broader effects, outcomes, opportunities, and/or risks for citizens in general. • Brief comments would be a 5 and with details demonstrating an in-depth understanding would be a 6. • There should be explicit references to the sources.

4. With reference to Sources A–D and your own knowledge, discuss the opportunities **and** dilemmas of the use of street view imagery (SVI) applications, such as Google Street View. **[12]**

Answers may include:

Opportunities and dilemmas drawn from range of stakeholder perspectives
- Citizens – safer from criminals (C) but property could be targeted (D)
- Businesses wanting to attract customers can be located using SVI (e.g., Source D)
- Governments and government agencies that may control the capture and use of images (e.g., Source B Source C) Could be used by crime squad and assist in finding lawbreakers
- SVI developers/contributors (e.g., Source A)

Improved technology leading to improved identification
- SVI uses technologies that continually improve over time. Higher quality images, better resolution, increased frequency of image capture and interlacing (e.g., Source A)
- Capturing techniques are improving, e.g., Hardware for capture and software (AI) for processing (Source A). Surveillance issues (Source C) may improve leading to the identification of behaviors which could be used against/in support of citizens.
- Better technology leads to faster publishing requiring increased improved monitoring by privacy groups/individuals
- Improved technology ALSO leads to a better virtual experience, showing greater detail and depth, enhancing the quality of the experience.

Digital Divide
- Implications for not mapping in areas (Source B).
- Concerns over the language options in the mapping application. Is it accessible for all?
- Access to devices: Is a mobile device required for optimal use? Is access to Internet required? What are the minimum specification requirements of device? Is there access to charging as using SVI applications may drain device battery.
- SVI applications may reduce the Digital divide by virtually enabling users to see/explore/interact in areas they otherwise would not have been able to visit (B)

Ethics and Values
- Is it acceptable to capture images and citizens on public property as well as images of private property that is viewable from public property? (All)
- Do citizens have rights? Has the citizen given permission (to have their property/their car/their family etc.) to be captured? How can a citizen remove the permission/remove photo? (e.g., Source D)
- Permission by default. Citizens have to opt out when they discover they or their property is exposed/published. Blurring of houses and locations is by request while blurring of people's faces and number plates are automatic (e.g., Source D).
- Can images be used as evidence of crimes (e.g., Source C)
- SVI enables transparency and open access to information enabling the users to make informed decisions based on their viewing experience.

Ownership:
- Who owns the images and what happens to this?
- Do SVI applications store the raw files pre-processing (i.e., before blurring). (A)
- Is it right that private companies have data pertaining to citizens of a different country?

Access:
- Opportunities for both criminal activities and positive reasons. Businesses may attract more customers as they can learn more about the business in advance, e.g., (Source D) find parking and local environs. However, could be used to plan burglaries as able to scope out the areas – look at open windows, cars in location, etc.(D)

Reliability of data:
- Images may be outdated, e.g., area may be devastated by a recent flood however images captured are prior to the event or area may have been improved (e.g., Source B)
- Does the automated AI capture and blur all faces and number plates? (e.g., Source A, C and D)
- What if home is blurred by previous owner or by mistake? Can it be unblurred? (Source D)
- Are there standards for the quality and accuracy of the data captured (e.g. Source A)

Learning about other communities
- Empathy for fellow citizens generated by the immersive experience
- Have's and have not's - could lead to more hostility? (e.g., Source B)
- Promote a one world view as Google which is English-based (e.g., Source A and B)
- Incomplete mapping means more remote community often not represented. Most mapping is road or along popular trekking pathways or has financial/commercial basis (e.g., Source B)
- Superficial images may not reflect the actual community – poor areas have been shown to be some of the happiest (e.g., Source B)
- Images captured in seasons may be misleading (e.g., Source A and B).
- Use in education – geoguessr

Keywords: *privacy, anonymity, representation, data, reliability, perspective, artificial intelligence, digital divide, regulation, change, identity, power, spaces, systems, ethics, values*

Marking notes:
It is not necessary to explicitly refer to each source to achieve the highest mark band.
To achieve the highest marks the sources must be synthesized in an integrated manner rather than a systematic analysis of each individual source.

Developing a common understanding of the 3Cs in the context of this question.

The 3Cs are usually embedded in discussions, with ideas that frequently intersect within the same C and across other Cs. e.g. ethics/values and privacy, privacy and data (ownership)

3Cs	From the guide	Suggestions of what we are looking for in the response
Context	Cultural, economic, environmental, health, political, social, Human Knowledge	How is SVI is being applied/used in and beyond the source (contextualised) : • people are using this for education (human knowledge), • tourism (cultural), • navigation (environmental/human knowledge), • criminal activity arising from the use of SVI (political - about law/policy) • Financial opportunities such as advertising, tagging images, "what's close to me searches" (economic) • Privacy (cultural/social)
Content	Data, Algorithms, computers, Networks and the internet, Media, AI Robots and autonomous systems	**The technology that underpins SVI includes:** **Data:** who owns the images,where is it stored? **Algorithms:** how is AI used, reliability, update rate, training set used **Computers:** what are the specific components in the system? **Internet:** access to the application, equity of access, digital divide **Technology from Source A:** GPS, visualisation, mapping, AI, geolocation, sensors UI/UX, editing and storage, real-time vs asynchronous *Please note that SVI is NOT real-time surveillance - some candidates are confused.*
Concepts	Change, identity, expression, power, space, systems, value and ethics	**Change:** new approaches to educational activities, business practices, navigation **Expression:** censorship, access, perspective **Identity:** privacy, anonymity, representation **Power:** control, access, ability to update/change/edit/delete, reliability, regulation **Systems:** ownership, control, intellectual property, individual rights, collective rights, government authority, reliability, accuracy, bias **Value and ethics:** privacy, security, censorship, freedom of expression, freedom of information, perspective

The following markband should be used for responses to Question 4.

SL and HL Paper 2, question 4	
Marks	**Level descriptor**
0	• The work does not reach a standard described by the descriptors below.
1–3	• The response shows a limited understanding of the demands of the question. • There is limited relevant knowledge. • Evidence from sources is not integrated with the response. • The response has limited organization.
4–6	• The response shows some understanding of the demands of the question. • Some knowledge is demonstrated but this is not always relevant or accurate. • Evidence from sources is partially integrated into the response. • The response is partially organized.
7–9	• The response shows adequate understanding of the demands of the question. • Relevant and accurate knowledge is demonstrated with some lapses. • There is adequate integration of evidence from the sources, but this is not always sustained. • The response is adequately organized.
10–12	• The response is focused and shows an in-depth understanding of the demands of the question. • Relevant and accurate knowledge is demonstrated throughout, adding insight to the response. • There is consistent and effective integration of evidence from the sources. • The response is well-structured and effectively organized.