



FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

Presented at the FIG Working Week 2024,
19-24 May 2024 in Accra, Ghana



Socializing with Artificial Intelligence (AI) on Spatial Development in Sub-Saharan Africa

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Presentation Key Points



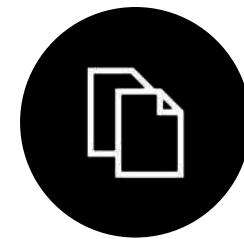
INTRODUCTION



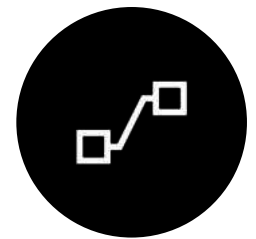
LITERATURE



METHODOLOGY



RESULT



CONCLUSION

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I. Introduction

- The presentation explores how AI can visualize spatial planning and development by turning text descriptions into images.
- It showcases the use of Bing Image Creator images in spatial development, highlighting the potential of AI in spatial planning and development in SSA.
- With the radical evolution of AI, spatial planning and development are now facing an era of digital transformation.
- AI can transform scientific research by creating high-resolution images and detailed visuals from text or voice commands.





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II. Literature:

A. Socializing with AI Through Prompt Engineering

- Interacting with AI, refers to using prompts—text instructions provided to AI models to guide desired actions (Pearson, 2023).
- Prompts can take on different forms, such as text-to-text, text-to-image, text-to-speech/audio, or text-to-video models (Wang et al. 2023)
- A text-to-text model can answer queries like “*What is the origin of GIS*” and a prompt for a text-to-image model might be “*Produce a realistic image of Ashanti communities of Ghana between 1789 and 1799.*”
- Precise language in prompts is crucial for AI interactions and significantly influences the output generated by AI.

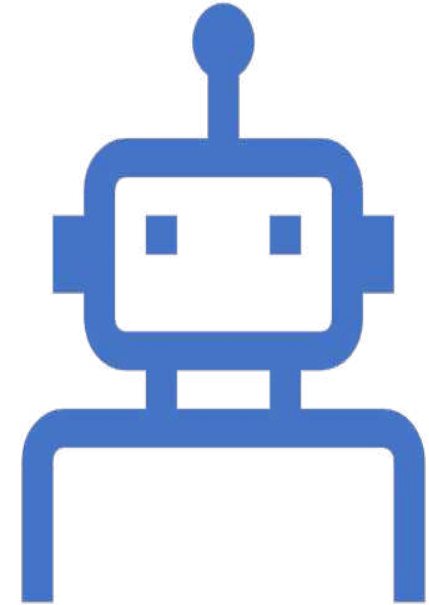




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II. Literature:

B. Bing Image Creator

- Some of the most tested and reliable text-to-image creators that use AI are: AI are Visme, Craiyon, Deep AI, Runway AI, Bing Image Creator, Midjourney, DreamStudio, Wombo Dream, NightCafe etc.
- This study used Bing Image Creator, a Microsoft AI model that creates futuristic and realistic images from descriptions.
- Image Creator applies to art and graphic designing and can transform any image into geometric representations.
- Image Creator is a free AI platform for learning and experimentation, but its specific style and lack of customer support limit its creative range (Khatri, 2023).

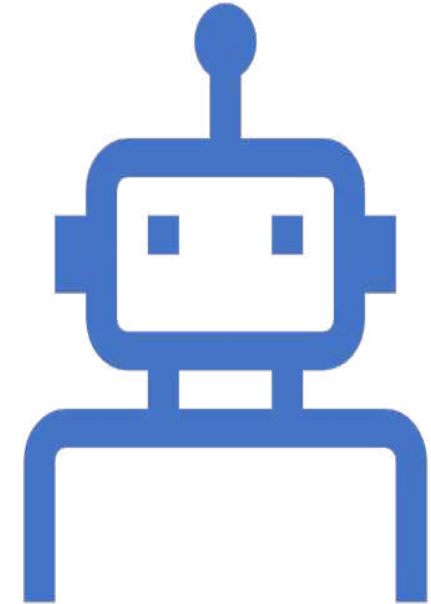




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IV. Methodology

1. **Image Creation:** identified key spatial planning concepts and converted them into text prompts to create more than 2-4 images using *Image Creator*. Images were objectively selected and interpreted in text.
2. **Image Interpretation:** Images were interpreted by identifying objects, features, patterns, shapes, and emotional expressions. Contexts were considered and accuracy in depicting real-world scenarios, ensuring they accurately represent the actual world.
3. **Limitation:** - Creating effective prompts for AI interaction proved challenging and the prompts used in this study may have been better constructed. McGee (2023) suggests using AI-based applications like "ChatGPT" for command crafting. All prompts used in this study were formulated by the researchers.





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V. Results: Text-to-image prompt conversion table

Spatial development terms	Definitions or descriptions	Text-to-image prompt
Artificial Intelligence	Artificial intelligence (AI) is the intelligence embodied in software or software (McGee, 2023; Zamfirescu-Pereira et al., 2023).	Introduce yourself by showing me a photo of Artificial Intelligence.
Sub-Saharan Africa	Sub-Saharan Africa (SSA) is racially, geographically, linguistically and culturally diverse.	Show me an image description of the sub-Saharan African region.
Spatial development	A process that focuses on turning decisions related to the coordination and spatial distribution of land use into development outcomes through coordinated activities (Auzins & Chigbu, 2021).	Show me an image representing spatial development as a process used for making decisions about how to distribute people, natural resources and buildings in spaces so people can live a good life.
Land administration	Land administration provides the basic infrastructure for implementing land-related policies and land management strategies to ensure social equity, economic growth and environmental protection (Williamson et al., 2010).	Produce an image that represents land administration.
Informal settlement	Human settlements located outside the planned areas or not recognized by the formal regulations as a places of habitation (Kohima et al. (2023).	Give me a photo description of an informal settlement in sub-Saharan Africa.
Kumasi	A city in Ghana	Show me a land use plan for Kumasi city in Ghana, including a legend showing the various land uses and features.
Community	A community is a group of people with a shared socially significant characteristic, such as place, set of values, culture, values, traditions, or identity (Chigbu et al., 2018).	A community where men, women, girls and, boys and babies share the same settlement, culture, and identity.



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V. Results: Text-to-image prompt conversion table

SSA community	SSA urban communities are characterized by people mostly connected within and across filial, inter and intra-ethnic ties, a shared language, shared geography, natural resources, distinct rules and customs, shared values and obligations, concern for improving their living conditions, and an inclusive perspective that encompasses catering for the needs of the dead, the living and the unborn (Walzer, 2010).	Show community in urban sub-Saharan Africa, their culture, natural resources, rules, and where people consider the welfare of people past, living and unborn, including shared values and language.
Community development	Community development in SSA relates to improving the physical aspect of a group of people but also includes the cultural, social, environmental, economic, and political scenarios (Abebe 2013).	Depict community development in sub-Saharan Africa where people take actions to improve their living conditions, including the physical environment, economy, social infrastructure, and culture, so that they can live a life where basic needs are available.
Imposed community development	Imposed community development efforts seek to improve the living conditions of a community through physical and economic development, primarily by developing infrastructure and technology (Matarrita-Cascante & Brennan, 2011).	Show an image of community development in urban sub-Saharan Africa as “imposed actions” on people to improve their living conditions in their place.
Self-help community development	A form of community development where members of the community self-conceive projects and lead in pursuance of their community vision (Azubuike et al., 2023).	Show an image of community development in urban sub-Saharan Africa as “self-help actions” taken by people to improve their living conditions in their place.
Directed community development	This combines imposed and self-help community development (Ekowati et al., 2023).	Show an image of community development in urban sub-Saharan Africa using both “imposed” and “self-help” actions taken by people to improve their living conditions in their place.



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V. Results

A. Artificial Intelligence

- Figure 1 is an AI-generated image representing an “image of AI” using Image Creator.
- Image Creator presents AI as a machine-wired female with a networked crystal ball, symbolizing knowledge and intelligence. Female gendering increases humanness perceptions and acceptance of AI, suggesting the AI is aware of its non-human nature but must appeal to humans for acceptance.

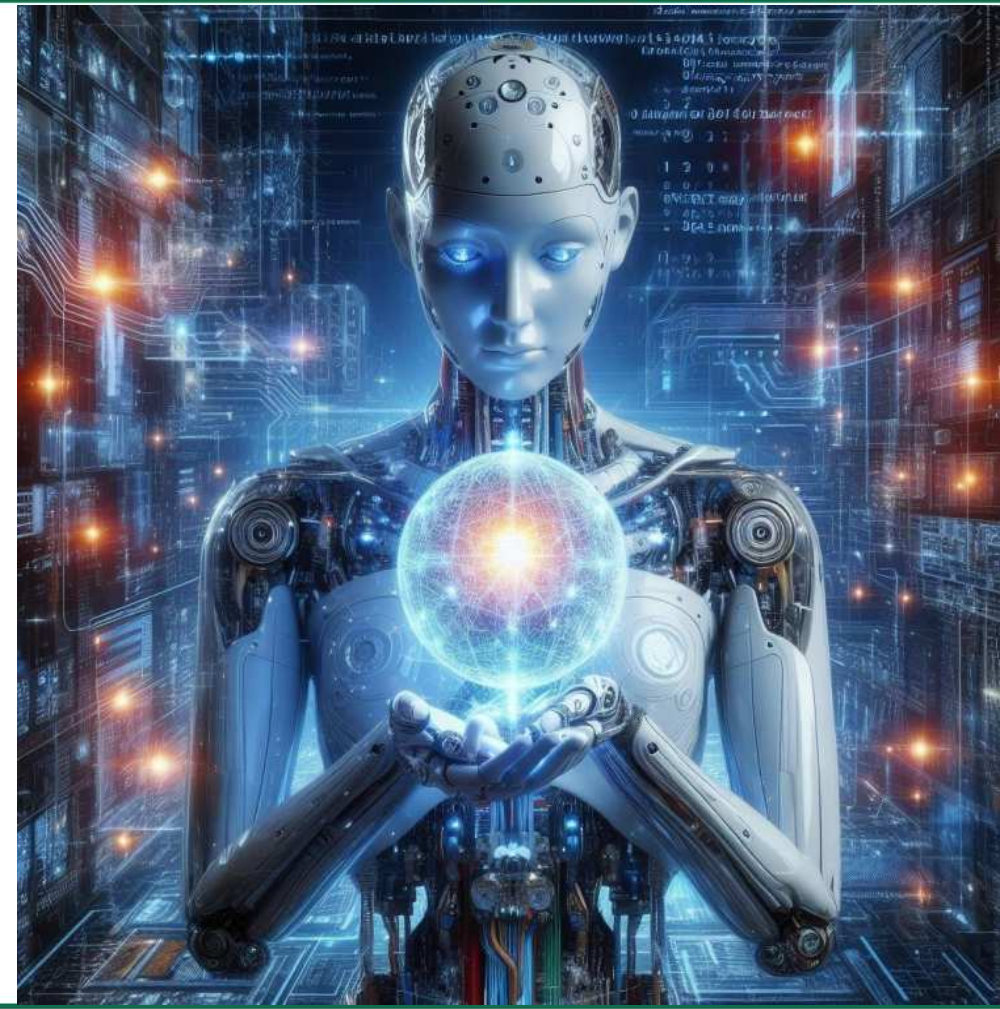




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V. Results

B. Spatial Development

- Figure 2 illustrates an AI-generated image representing “spatial development”
- It represents the idea of spatial development in real life -being a consequence of planning by humans (the hands) and conducted to ensure that activities and permanent objects (buildings, infrastructure, amenities, etc.) are strategically distributed and connected to link the natural and built environment.





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V. Results

C. Informal Settlement

- Figure 3 illustrates an AI-generated image representing the concept of "informal settlement" using Image Creator.
- AI's interpretation of an informal settlement in Sub-Saharan Africa highlights overpopulation, high-density communities, informal economy, lack of infrastructure, poor waste management and poor housing conditions.





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VI. Conclusion

- Debates exist on AI: some see it as mere data regurgitation, while others view it as a path to data-driven innovation.
- This paper showcases both the actual results and potential of AI in spatial development.
- AI offers quick and user-friendly visualization tools for land sector activities, particularly in spatial development planning.
- This explorative study aims to raise awareness of AI's potential in planning and decision-support systems.
- Further research is essential to fully explore AI's role in sustainable development.

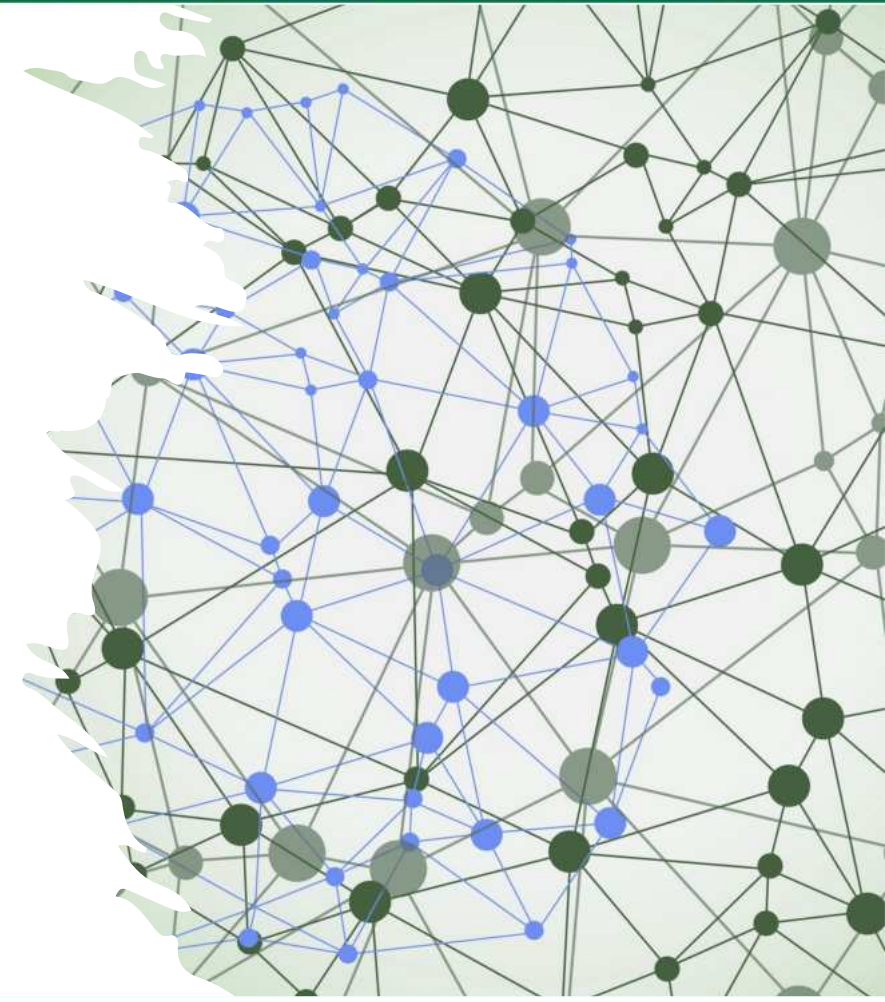




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