A vision for the creation of 6G communications

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Now that the standardization of fifth-generation (5G) communications has been accomplished, with the 5G network set to be launched this year, researchers have already started thinking about what a 6G network could look like. An interesting perspective on the future development of 6G can be found in a paper published in *Nature Electronics*, carried out by researchers at King Abdullah University of Science and Technology (KAUST), in Saudi Arabia.

The recent paper offers a possible vision for 6G communications, which could be used as a guide for research in the post-5G era. This vision is based on a series of speculations that the researchers made about the future of telecommunications.

"Our speculations are summarized from our state-of-the-art research activities in recent years, related to terahertz radios, terrestrial-aerial-space integrated networking, novel modulation schemes and artificial intelligence-aided communications," Shuping Dang, one of the researchers who carried out the study, told TechXplore. "The main objectives of this perspective paper were to define the key potential features of 6G, discuss the required communication technologies and explore issues beyond communication technologies that could hamper future research and the deployment of 6G."

As is the case for 5G, human-centric mobile communications will likely be the most prominent application for the 6G network, according to Dang and his colleagues. As a result, those developing this new network should pay particular attention to aspects such as security, secrecy and privacy. In their paper, the researchers also suggest that artificial intelligence (AI) could play a particularly important role in 6G communications, bringing a significant wave of innovation in personal communications.

"Artificial intelligence and machine learning could bring unprecedented communication services and experiences to users," Dang explained. "However, we should always be aware of the accompanying challenge of privacy protection, as well as the risk of potentially creating a horrific world watched and controlled by a technocratic Big Brother."

As Dang and his colleagues believe that 6G communications will be of a human-centric nature, they also feel that they should be made readily accessible to users living in densely populated urban areas and those in rural or developing regions. Only by reaching a variety of regions will the 6G network ultimately enable a faster connectivity worldwide.

"Most importantly, we must admit that the advancement of wireless communications is highly restricted by basic sciences, especially mathematics and physics, as well as information theory and electronics," Dang said. "Without breakthroughs in these subjects, the essential improvement in the capacity- and delay-related performance metrics of communication systems would be impossible."

In their paper, the researchers highlight many important considerations that those working on developing a 6G network should keep in mind, while also identifying some issues that could potentially hinder its development and deployment in the future. In addition to presenting their overall predictions about the future of communications, Dang and his colleagues devised a systematic framework that anticipates some possible application scenarios for 6G, dividing them into categories.

While the predictions made by Dang and his colleagues are mainly based on speculation, they could become useful when 6G network development becomes a tangible reality. In the meantime, the ideas presented in this recent paper could serve as a general guideline for other 6G-related research activities, reminding engineers working on these projects how important it is to tailor communications around individual users.

"We now plan to explore ways to enhance security, secrecy and privacy for 6G communications," Dang said. "We are currently studying a decentralized, high-performance network architecture enabled by terahertz spectra and federated learning techniques."

More information: Shuping Dang et al. What should 6G be?, *Nature Electronics* (2020). DOI: 10.1038/s41928-019-0355-6