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Quantum Inspired Security on a Mobile Phone

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Abstract : The widespread use of mobile electronic devices increases the complexities of mobile security. This thesis aims to provide a secure communication environment for smartphone users. Some research proves that the one-time pad is one of the securest encryption methods, and that the key distribution problem can be solved by using the QKD (quantum key distribution). The objective of this project is to design an Android APP (application) to exchange several random keys between mobile phones. Inspired by QKD, the developed APP uses the quick response (QR) code as a carrier to dispatch large amounts of one-time keys. After evaluating the performance of APP, it allows the mobile phone to capture and decode 1800 bytes of random data in 600ms. The continuous scanning mode of APP is designed to improve the overall transmission performance and user experience, and the maximum transmission rate of this mode is around 2200 bytes/s. The omnidirectional readability and error correction capability of QR code gives it a better real-life application, and the features of adequate storage capacity and quick response optimize overall transmission efficiency. The security of this APP is guaranteed since QR code is exchanged face-to-face, eliminating the risk of being eavesdropped. Also, the id of QR code is the only message that would be transmitted through the whole communication. The experimental results show this project can achieve superior transmission performance, and the correlation between the transmission rate of the system and several parameters, such as the QR code size, has been analyzed. In addition, some existing technologies and the main findings in the context of the project are summarized and critically compared in detail.

Keywords : one-time pad, QKD (quantum key distribution), QR code, application
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