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Low cost robotic tape library systems using open source software and hardware

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The SKA-SA is building a radio telescope that will output a total raw data of 62 EB annually. Most of the data will be inactive and rarely accessed however needs to be safely stored for 10-15 years. The data is not sensitive and there is no urgency when it has to be retrieved. The challenge is finding a cost-effective data storage architecture that has the capacity, longevity and reliability fit for purpose. Amongst available architectures in the market, the tape library is the most affordable one. Yet, its purchase costs (including installation and licensing) from leading manufacturers are enormous. There is also a perpetual development of open source robotics technology (like CNC machines, 3D printers, etc.) which in principle is similar to that of the tape library. The same technology can be harnessed and repurposed into the tape library industry to tremendously drive down costs. This disruption could potentially improve the tape library technology and be of benefit to small businesses and scientific organizations. In the project approach, the development of the tape library was sectioned into 4 main modules: (1) Storage assembly made from extruded beams and 3D printed cartridge cells; (2) Robotic manipulator moving in 2 axes using Arduino and Grbl for controlling actuators; (3) End-effector that picks and grabs tapes during operation which is controlled by an Arduino shield; and (4) Support accessories for monitoring, reading tapes and coordinating the operational process using Raspberry Pi. This approach cuts cost by 75% and the storage capacity is nearly of that acquired from leading manufacturers. It uses LTO industry standards as well and assumes competitive performance specifications like scalability, compatibility and ease-of-assembly. This is a work in progress project where reliability and robustness of the tape library using open source technology are to be evaluated.

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Biography

Rea Nkhumise is a Robotics Engineer for the SKA-SA Science Data Processing Department. He holds an MSc in Mechatronics Engineering from Tennessee Tech University (USA) with specialty and experience in computational intelligent, control algorithms and embedded system design. His background is mechanical engineering. He has designed and built multiple automated products using open source hardware and software, especially Arduino supported, which are currently commercial.

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