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The Highlights of the IFLA WLIC Preconference Satellite Meeting
Information Technology Section - Robots in Libraries: Challenge or Opportunity
August 21 & 22, 2019, Wildau, Berlin, Germany
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On August 21 & 22, 2019, I attended the IFLA WLIC Preconference Satellite Meeting - Robots in Libraries: Challenge or Opportunity at Technical University of Applied Sciences Wildau, Berlin, Germany.

In her presentation entitled “AI-powered Robots for Libraries: Exploratory questions”, Bohyun Kim, CTO for the University Libraries and Associate Professor from the University of Rhode Island, USA, first had an overview about definitions of Robot and AI-Powered Robots. Then she focused on three topics: (1) what kind of robots we may expect to see at libraries in the future; (2) what kind of human-robot relationship may be formed in people’s information-seeking activities; (3) what ethical and social issues may arise from the new human-robot relationship.

Regarding robots for libraries, she gave some examples such as AuRoss, a robotic shelf scanning system in Singapore National Library, Nao robots in Westport Public Library, USA, Finch robots in Chicago Public Library, and Robot Day in San Diego Public Library, USA. Areas for robot adoption include greeting & directions, access services, reference, reader’s advisory service, reading robot, etc.

Regarding human-robot interactions at libraries, she focused on following topics such as the role of an assistant and a companion that help library users with accomplishing a variety of tasks and the relationship between robots and users is likely to be positive and friendly.

She argued that stricter guidelines might be needed for library robots involved in the library patron’s information-seeking activities. She pointed out in the future, more sophisticated, versatile, and autonomous robots will appear at our homes, workplaces, and libraries. However, neither our society nor the library yet fully understands how the wide adoption of robots will affect us. AS a new type of social agent, robots will generate a lot of interesting questions.

I was the second speaker. My presentation title is “A Post-implementation Review Analysis for an Autonomous RFID Inventory Project: A Qualitative Study” that I co-authored with Zhengwei Xia, Associate Research Librarian and his research team from Wuhan University Library.

I briefly introduced the RFID Robot Inventory Project implemented in Wuhan University Library. The research team used a post-implementation review analysis method such as stakeholder needs analysis by using surveys, interviews, and experiments to examine three hypotheses: the RFID locating function can help end-users to find books more quickly (Hypothesis 1); the RFID robot system improves inventory work efficiency (Hypothesis 2), and; the RFID robot system improves

inventory accuracy (Hypothesis 3), and make recommendations to areas for improvement identified through the review. Our analysis and experiments results positively supported the three hypotheses. Finally, our study proposed some recommendations to areas for improvement such as enhancing locating algorithms; ensuring network connected; migrating location calculation to a local server; providing more training to library staff and patrons, and; promoting the locating function to patrons. Professor Fu also answered some questions asked by some attendees.

Juja Chakarova, Head of Library from Max Planck Institute Luxembourg for Procedural Law, Luxembourg, and Johannes Trabert, Executive Partner from MetraLabs GmbH, Germany introduced they used the Tory robot of MetraLabs to do an inventory test. In one hour, Tory can read 35,000 books with an accuracy of 99.11%. They also discussed new areas of robot implementation in libraries. In addition, they reported the results of the ‘Robots in Libraries’ survey 2018. The survey was conducted in 2018 among big university and public libraries (how many? no data) in 9 European countries. Only 5.45% libraries use robots for inventory. It gives a snapshot of the current robot implementation, the future expectations and concerns of the librarians.

Elfriede Ludwig, Librarian & Head of Digital-Services-Team at the Public Library of Frankfurt am Main, Germany, presented her paper entitled “What the robots are doing at the Public Library of Frankfurt. NAO, DoBot, Dash and Dot - a whole variety of robots moved into the Public Library of Frankfurt in early August with the kick-off for the “Robot-Invasion” event. This “Robotics and Coding” project is part of the evolving strategy that initially started with the formation of the “Digital-Services-Team”. Dash and Dot shall playfully arouse the interest of children and adolescents, DoBot teaches young people and young adults how robots function in the industry, and NAO explains to our patrons how the Public Library works.

Yi Chin Liao, Head of Innovation and Digital Media, National Library Board Singapore, Singapore, presented her paper entitled “transforming library operation with robotics”.

At Singapore public libraries, robots and automatic sorting machines are used to help staff and volunteers with sorting returned books, shelf reading, and transportation of library materials. The National Library Board (NLB) has embarked on its robotics journey in 2013 with the introduction of autosorter at the library@Chinatown. Since then, NLB has leveraged on technologies and robotics to re-engineer its library operations and automate many of the labor-intensive and time-consuming tasks.

The paper shares how the adoption of robotics and automation technologies has transformed the library operation and improved customer experience at the libraries.

The initiatives include

- Autosorters that automatically sort returned books by categories as well as identifying popular titles to be placed at “Just Returned” shelves.
- Shelf reading robot that autonomously scans the bookshelves after the library closes and provides up-to-date shelf location of books and flags out misplaced books.
- Mobile Bookdrop that autonomously transports the returned books to the backroom

Process re-design is crucial to the successful adoption of robotics. NLB conducted a business process re-engineering (BPR) exercise to review its shelving operations and adopted a proof-of-concept approach to test out the proposed workflow and process changes against initial prototypes. Extensive trials were also conducted with the library staff to address operation concerns and to ensure a smooth change transition.

These innovations have helped to achieve cost savings and simplified workflow for the aging workforce, in addition to bringing convenience to citizens. The operation staff can now take on other higher-value tasks such as engaging patrons and conducting library programs. Moving forward, NLB will be exploring the use of service robots such as chatbots to provide more timely and responsive services to library users.

Takashi Harada, Professor, Doshisha University, Japan, presented his paper entitled “Robotics and artificial intelligence technology in Japanese libraries.”

Robotics and artificial intelligence technology are rapidly spreading in libraries. Conventionally, libraries have used an auto book circulation system or automated storage and retrieval system (ASRS) both with automatic control technology and IC tags. In recent years, robots have been used in various other places in Japanese libraries. A guiding humanoid robot is a typical example. The humanoid robot Pepper developed by Softbank is already active in dozens of libraries, and there are plans to introduce 500 or more. As a guiding robot, animal type robots such as a rabbit are also used.

Also, many robots work behind the scenes in libraries. For example, an auto-tracking bookrack makes it possible for a librarian to perform return processing without having to operate a heavy bookrack. The robot suit HAL (Hybrid Assistive Limb), which was developed at the University of Tsukuba, assists lifting work and reduces the burden on the waist. The Tsukuba Central Library uses HAL to lift heavy bookcases onto a bookmobile.

Furthermore, artificial intelligence technology is being used for reading assistance and programming classes in libraries. The game "KOKORO" Saver, which Doshisha developed, has a mechanism to recommend children's books according to their interests. Kinki University library analyzes the content posted on social networking sites (SNSs) and introduces books that match the potential interests of the student. Although the use of robots in the library is still developing, it is expected that robots will be used more and more in the library.

A couple of speakers from Africa shared their experience of using robots and the investigations of the academic library infrastructural readiness for deploying robots. Researchers at Jaume I University in Spain introduced the UJI library robots they developed. Experts from the RoboticLab Telematics at Wildau Technical University of Applied Sciences in Germany, shared plans to use the Natural Language Processing to enable Pepper they purchased from Japan to talk to their library patrons in German.

The entire presentations have been live-streamed and the full text of the papers will be published in the IFLA Library and can be open accessed by anyone in the world. The speakers and attendees

also attended a couple of discussion sessions. I attended all sessions on the two days and had a good opportunity to learn from and connect with other speakers and attendees.

The pre-conference schedule and live streaming can be accessed here <https://en.th-wildau.de/university/central-facilities/university-library/ifla-wlic-preconference-satellite-meeting/timetable/>

2019 国际图联大会会前卫星会议信息技术分会的亮点集锦

主题：机器人在图书馆：挑战或机遇

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2019 年 9 月 4 日

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2019 年 8 月 21 日和 22 日，我参加了在德国柏林 Wildau 应用科技大学召开的国际图联大会 IFLA WLIC 会前卫星会议信息技术分会。分会主题是“机器人在图书馆：挑战或机遇。”

在她的题为“用于图书馆的人工智能机器人：探索性问题”的演讲中，来自美国罗德岛大学的大学图书馆副教授兼首席技术官 Bohyun Kim 首先概述了机器人和人工智能机器人的定义。然后，她专注于三个主题：（1）我们可能期望在未来的图书馆看到什么样的机器人；（2）人们的信息搜寻活动可能形成什么样的人机关系；（3）新的人机关系可能产生什么样的伦理和社会问题。

关于图书馆的机器人，她举了一些例子，例如 AuRoss，新加坡国家图书馆的机器人货架扫描系统，美国 Westport 公共图书馆的 Nao 机器人，芝加哥公共图书馆的 Finch 机器人，以及美国圣地亚哥公共图书馆的机器人日。机器人采用的领域包括问候和指示，访问服务，参考，读者咨询服务，阅读机器人等。

关于图书馆的人机交互，她专注于以下主题，例如助理的角色和帮助图书馆用户完成各种任务的伴侣，以及机器人和用户之间的关系可能是积极和友好的。

她认为，参与图书馆顾客信息搜寻活动的图书馆机器人可能需要更严格的指导方针。她指出，在未来，我们的家庭，工作场所和图书馆将出现更复杂，多功能和自主的机器人。然而，我们的社会和图书馆都没有完全理解机器人的广泛采用将如何影响我们。作为一种新型社交代理，机器人将产生许多有趣的问题。

我是第二位演讲嘉宾，作为共同作者，我与武汉大学图书馆夏正伟副研究馆员及其研究团队一起撰写了题为“自动 RFID 机器人盘点项目实施后评估分析：定性研究”的论文。

我简要介绍了武汉大学图书馆实施的 RFID 机器人盘点项目。研究团队使用实施后审查分析方法，如利益相关者需求分析，通过调查，访谈和实验来检验三个假设：RFID 定位功能可以帮助最终用户更快地找到书籍（假设 1）；RFID 机器人系统提高了盘点工作效率（假设 2）；RFID 机器人系统提高了盘点准确性（假设 3），并通过分析提出了改进建议。我们的分析和实验结果肯定地支持了这三个假设。最后，我们的研究提出了一些改进领域的建议，如增强定位算法；确保网络连接；将位置计算迁移到本地服务器；为图书馆工作人员和用户提供更多培训，以及向用户宣讲提升定位功能。演讲结束我还回答了一些与会

者提出的问题。

卢森堡马克斯普朗克大学图书馆负责人 Juja Chakarova 和德国 MetraLabs GmbH 执行合伙人 Johannes Trabert 介绍了他们使用 MetraLabs 的 Tory 机器人在卢森堡这个大学图书馆进行的一次测试。在一个小时内，Tory 可以阅读 35,000 本书，准确率为 99.11%。他们还讨论了图书馆机器人实施的新领域。此外，他们报告了 2018 年“图书馆机器人”调查的结果。该调查于 2018 年在 9 个欧洲国家的大型和大型图书馆（有多少图书馆？报告没有数据）中进行。只有 5.45% 的图书馆使用机器人进行盘点。他们的报告提供了当前机器人在欧洲实施的快照，未来的期望和图书馆员的关注。

图书馆员兼德国法兰克福公共图书馆数字服务团队负责人 Elfriede Ludwig 发表了题为“机器人在法兰克福公共图书馆正在做什么”的论文。NAO, DoBot, Dash 和 Dot - 各种机器人于 8 月初搬入法兰克福公共图书馆，启动了“机器人入侵”活动。这个“机器人和编码”项目是最初从形成“数字服务团队”开始的不断发展的战略的一部分。Dash 和 Dot 应该有趣地引起儿童和青少年的兴趣，DoBot 教年轻人和年轻人机器人在行业中的运作方式，NAO 向我们的顾客解释公共图书馆的运作方式。

新加坡国家图书馆理事会创新与数字媒体负责人 Yi Chin Liao 发表了题为“用机器人技术改造图书馆运作”的论文。

在新加坡公共图书馆，机器人和自动分拣器用于帮助工作人员和志愿者分类归还书籍，阅读书架和运输图书馆资料。2013 年，国家图书馆理事会（NLB）开始了机器人之旅，并在唐人街图书馆引入了自动分拣器。从那时起，NLB 利用技术和机器人技术重新设计其图书馆运营，并自动完成许多劳动密集型和耗时的任务。

本文分享了机器人技术和自动化技术的采用如何改变了图书馆的运作并改善了图书馆的客户体验。

这些举措包括

- 自动分拣器，按类别自动对退回的书籍进行分拣，以及识别要放置在“Just Returned”货架上的热门标题。
- 架式阅读机器人，在图书馆关闭后自动扫描书架，提供书籍的最新书架位置，并标出放错位置的书籍。
- 移动还书机器人，可自动将退回的书籍传送到后台。

流程重新设计对于成功采用机器人技术至关重要。NLB 进行了业务流程重新设计（BPR）练习，以审查其搁置操作，并采用概念验证方法来测试建议的工作流程和针对初始原型的流程变更。还与图书馆工作人员进行了广泛的试验，以解决运营问题并确保顺利进行变革。

除了为市民带来便利之外，这些创新还有助于为老龄化劳动力节省成本和简化工作流程。现在，操作人员可以承担其他更高价值的任务，例如聘请顾客和开展图书馆计划。展望未来，NLB 将探索使用聊天机器人等服务机器人，为图书馆用户提供更及时，更快速的服务。

日本同志社大学教授 Takashi Harada 发表了题为“日本图书馆的机器人和人工智能技术”的论文。

机器人技术和人工智能技术正在图书馆迅速普及。传统上，图书馆使用具有自动控制技术和 IC 标签的自动书籍循环系统或自动存储和检索系统 (ASRS)。近年来，机器人已被用于日本图书馆的其他各个地方。引导人形机器人是典型的例子。由软银开发的人形机器人 Pepper 已经在几十个图书馆中活跃，并计划引入 500 或更多。作为引导机器人，也使用兔子等动物型机器人。

此外，还有许多机器人在图书馆的幕后工作。例如，自动跟踪书架使图书管理员可以执行返回处理而无需操作繁重的书籍记录。机器人套装 HAL (Hybrid Assistive Limb) 是在筑波大学开发的，可以帮助提升工作并减轻腰部负担。筑波中央图书馆使用 HAL 将沉重的书柜抬到书架上。

此外，人工智能技术正被用于图书馆的阅读辅助和编程课程。日本同志社大学开发的游戏“KOKORO”Saver 有一个根据自己的兴趣推荐儿童书籍的机制。近畿大学图书馆分析社交网站 (SNS) 上发布的内容，并介绍符合学生潜在兴趣的书籍。虽然图书馆中机器人的使用仍在开发中，但预计机器人将越来越多地用于图书馆。

还有一些来自非洲的演讲者分享了图书馆员使用机器人的体验以及他们对学术图书馆的架构做了一些调研以确定这些架构是不是已经准备好实施机器人等。西班牙 Jaume I 大学的研究人员介绍了他们开发的 UJI 图书馆机器人。德国 Wildau 应用科学技术大学机器人实验室的专家分享了准备在日本 Pepper 机器人的基础上使用自然语言处理开发使 Pepper 可以和读者用德语对话的计划。

整个会议的演示宣讲过程都被录像并可以在线播放，论文全文将在 IFLA Library 发表，世界上任何人都可以访问。会议还安排了几场演讲者和与会者的研讨。我参加了为期两天的所有会议，并有机会向其他发言者和与会者学习并添加了联系方式。

这个会前会议安排和录像播放请访问 <https://en.th-wildau.de/university/central-facilities/university-library/ifla-wlic-preconference-satellite-meeting/timetable/>