ICAR News

Issue three
06 I 17

Editorial

By Luning Sun

Welcome to the third issue of the ICAR News. It has been three years since the ICAR project started in 2014. We are now glad to see a growing ICAR community of almost 700 users, among whom around 200 are actively using ICAR measures in their research. The ICAR core team is very grateful for the support we have received from all of the collaborators and users. We will endeavour to develop more public-domain measures of cognitive ability, even beyond the end of the ICAR project.

In order to better showcase the ICAR measures available on the website and facilitate the users in search for a proper item type, we are now providing an item type catalogue, listing the existing item types with brief introduction and sample items. Please let us know if you have any feedback so that we can improve our service further.

In this issue, you will find two articles introducing online testing websites: discovermyprofile.com and sapa-project.org. **Discover My Profile** is a rebranded project that builds upon the success of **myPersonality**, which publishes the biggest dataset that combines both Facebook profiles and psychological test results. SAPA, acronym for **Synthetic Aperture Personality Assessment**, is an innovative data

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collection method well-suited for assessing personality and individual differences across multiple domains. Researchers from the University of Cambridge and Northwestern University will share with you their original thoughts and experiences with these web services.

Our last article in this issue will feature two newly developed R packages, "**mazeGen**" and "**AIG**". mazeGen is an automatic item generator for perceptual maze test, whereas AIG provides a range of functions capable of generating syllogistic reasoning items, basic arithmetic items, 2D and 3D rotation items. Both packages are now available for download from CRAN.

about the authors

Luning Sun

Luning Sun is Research Director of The Psychometrics Centre, University of Cambridge, UK. His research focuses on the application of advanced psychometric techniques in neuropsychological assessment.

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Discover My Profile

by Dr Luning Sun and Ms Fiona Chan

The myPersonality Facebook App (http://mypersonality.org/), created by Dr David Stillwell and Dr Michal Kosinski in 2007, proved to be the most successful online personality testing App ever developed. Within a few months of its launch it had provided millions of surfers with detailed reports on their personality profiles and, at peak, was receiving over 1 million visits per month.

The Psychometrics Centre, University of Cambridge relaunched this initiative with additional functionality and a new design in April 2015, under the heading 'Discover My Profile' (Figure 1). The platform builds on the facilities and services originally made available by myPersonality. It is also compatible with Concerto tests that employ advanced psychometric techniques, such as adaptive testing and automatic item generation.

Fiona Chan

Chan Yin Wah Fiona is a Psychometrician in The Psychometrics Centre and is also enrolled as a PhD student in the Department of Psychology at the University of Cambridge. Her area of specialism is Computer Adaptive Testing, Automatic Item Generation, and the development of matrix reasoning items for intelligence measurement.

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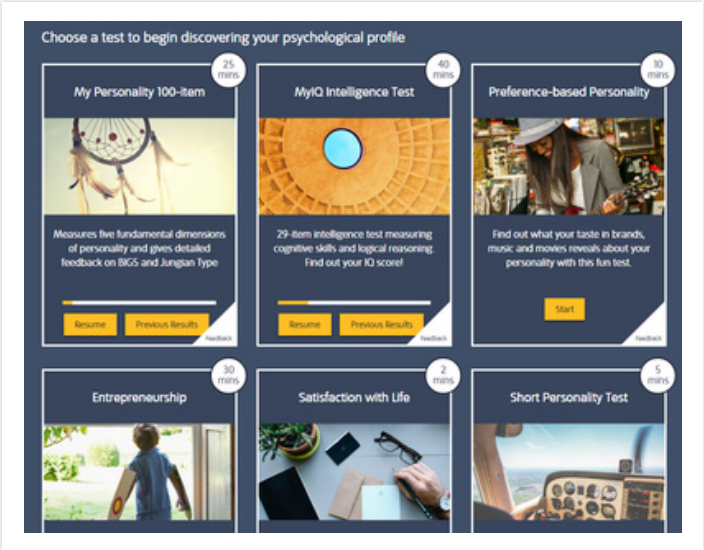

Figure 1

The platform currently allows users to take up to 58 psychological tests and questionnaires (and counting). It covers a wide range of assessment tools, measuring psychological traits including personality, cognitive ability, quality of life, relationship satisfaction, music taste, health, innovation, and so on. All the tests are free to take and users can easily save their progress on multiple sessions simultaneously. Most tests provide instant feedback, which users can opt to share on Facebook or Twitter, resulting in a social community around the platform.

Discover My Profile also allows affiliated researchers and students to host their own assessments (given sufficient ethical approval) and offer feedback to up to 35,000 daily participants around the world. Test developers will be able to not only gather a large dataset within a short period of time, but also link the test results across different domains. For example, Ms Fiona Chan, author of the well-known myIQ test, has benefited a lot from Discover My Profile. As a test developer, she finds the platform to be very well-designed for test administration. Besides its professional layout, the architecture of the website is very robust, because it allows tens of thousands of test-takers to use the website at the same time and remains perfectly stable. Its high level of security, efficiency and user-friendliness have attracted many researchers, both within and outside the Psychometrics Centre, to put their tests on the website as well as many Internet users who wish to explore their psychological traits. This gives the testing website two extra-strengths – researchers can collect good amount of data and collaborate with other test owners. To name an example, more than 7000 individuals completed Fiona's myIQ test in 3 days during peak traffic and the test continues to be a popular option for cross-validation for other tests on the website.

further reading

Take free psychological tests and questionnaires now on

discovermyprofile.com

The SAPA Project

by David Condon

One of the methods for validating the many new ICAR item types is by administering them through the data collection platform at SAPA-Project.org. While the survey on SAPA is similar to other personality tests online in that users participate in exchange for feedback about their personality, it's unique in that different sets of items are administered to each participant. The dynamically-generated feedback is based on participant's responses to the 135 items that comprise the SAPA Personality Inventory. Interspersed among these items, participants are also administered subsets of items from the remainder of the International Personality Item Pool and several other sources, including pools of items assessing interests, values, behaviors, personality disorders, and more. The feedback uses item-response based scoring to show each participant where they stand on the 27 lower order traits in the SPI as well as the familiar Big Five traits (Conscientiousness, Agreeableness, Neuroticism, Openness, and Extraversion).

Participants are also given a score on cognition --- these are based on items from the International Cognitive Ability Resource. For many years, SAPA-Project was only using ICAR items from the first four validated item types: Matrix Reasoning; Three-Dimensional Rotation; Verbal Reasoning; and Letter and Number Series. More recently however, we have begun administering many of the newer ICAR item types alongside the older set. This will allow for validation of the new types over the course of the next year or so. The new types include: Emotion Recognition, Compound Remote Associates, Arithmetic (Addition and Subtraction), Two-Dimensional Rotation, Figural Analogies, Propositional Reading, and Progressive Matrices. Validation will occur through a two-step procedure that first aims to identify a subset of representative items across a wide range of difficulties within each type. In the second step, we will collect data on these smaller subsets by administering them to large and diverse samples of participants. These data will be used to identify the IRT parameters and calibrate the new item types against those that have already been validated.

about the author

David Condon

David Condon is currently an Assistant Professor in the Department of Medical Social Sciences at Northwestern University in the United States. In addition to the development of cognitive ability assessment tools, David's research interests include evaluation of the relationships between cognitive ability and personality, interests, health and creative achievement.

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further reading

http://ipip.ori.org/

feedback

If you'd like to evaluate the new types, take the test at

SAPA-Project.org

We hope you'll let us know what you think!

Automatic Item Generators

By Aiden Loe

There are two main forms of Automatic Item Generators (AIG): functional and rule-based approach. The functional AIG focuses on the development of items without considering the cognitive processes at work. It is purely a mechanical/mathematical approach to designing a large set of item bank. Calibration of item parameters are typically conducted after data collection.

On the other hand, rule-based AIGs develop items following a set of cognitive processes and/or elementary operators that aims to explain the difficulty of the items. This enables the developers to predict the item parameters without the need to collect and analysis the data.

Both forms of AIGs are critical to psychometric testing. For example, functional AIGs are more flexible for studying the different cognitive strategies that participants employ during the test. This can give us further insight into how these cognitive strategies are used across different population (e.g. clinical, children, adult population). On the contrary, rule-based generators help us to create items with pre-calibrated estimates that can be immediately used for the targeted population. This reduces item exposure and increases test security, which is critical in high stake testing.

The research team at the Cambridge Psychometrics Centre is pleased to announce the creation of both forms of AIGs in two different R packages: “mazeGen” & “AIG”.

The mazeGen package is a functional AIG that allows developer to create perceptual mazes. Earlier research has supported that the perceptual maze test is a sensitive index of organic brain damage, with emphasis on the frontal and temporal lobes region. It is also considered a culture free cognitive test because it does not require prior knowledge to solve the maze. The structure of the maze follows the original Elithorn Perceptual maze (Elithorn, A. (1955). A preliminary report on a perceptual maze test sensitive to brain damage. Journal of Neurology, Neurosurgery & Psychiatry, 18(4), 287-292.). The maze is created in an HTML format which can then be used in Concerto Version 5 as an item template. Currently, it is possible to generate mazes with rank 3 to 20. The gold coloured dots are randomly distributed. However, the density of the dots can be pre-defined in the mazeGen functions. The latest package version is on CRAN and can be immediately used by researchers.

In the ‘AIG’ package, there are 4 generators: Linear Syllogistic Reasoning Items; Basic Arithmetic Items (addition, subtraction, multiplication);

about the author

Aiden Loe

Aiden Loe is currently a third year PhD candidate at the University of Cambridge. He is primarily interested in developing AIGs for research and modelling cognitive strategies using computational algorithms. Anyone interested in these topics please contact him at

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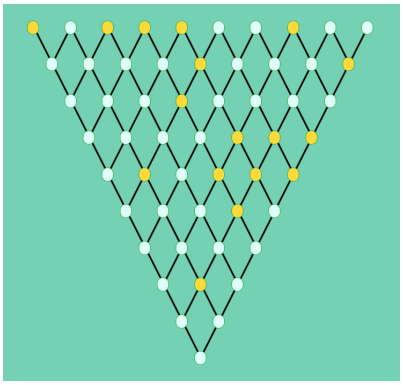

Figure 4. Maze of rank 10 with 30% saturation

2D Rotation Items; and 3D Rotation Items. Each of these generators allows the users to design the items according to certain specification.

Using the lisy() to generate linear syllogistic reasoning items allows the user to design the items in several ways that may influence the item difficulty. Currently, up to four distractors can be created automatically using the lisy() function.

Users can also increase the number of statements, or input their own subject names and the antonyms in the statement rather than having to rely on those in the function.

Using the arith() to generate basic arithmetic (addition, subtraction, multiplication) items allows the user to design the items in several ways that may influence the item difficulty. The magnitude of the value (1-9,1-99,1-999) can be determined by the user. The sequence of the numeric values (ascending or descending order) can be defined by the user. Furthermore, 7 distractors are automatically created for the user.

The spatial2d() and spatial 3d() allow users to generate their own 2D/3D spatial items. The answer and 4 distractors are automatically created for 2D spatial items. The 3D spatial items can be programmatically rotated based on the x, y, and z axis. It can also be rotated interactively, before saving the image. A 3D spatial mirrored item can be created using the spatial3dmirror().

We will be actively creating more AIGs for researchers to use for their own research. A third package (number series generator) is currently under development. To install the dev version (numGen), please go to (https://github.com/Aidenloe). Some of the item types are currently being placed online (www.openathan.com) for testing purposes. We are very interested in collaborating with other researchers in developing more AIGs and in hearing your feedback or suggestion with regards to the current AIG packages. Please contact us at bsl28@cam.ac.uk.

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Sentence:  Sam is older than  Edward,  Sam is younger than  Mary,  Mary is younger than  Susan,
Robert is older than  Susan,  Robert is younger than  Marcus,  Marcus is younger than  Bob,  Bob
is younger than  Amy. Which of the following is implied?

Number of inferences to solve the question: 3
Clues: 4 3 2

Answer:  Robert is older than  Sam.  Sam is younger than  Robert.
Distractor 1: Mary is younger than  Sam.(false)
Distractor 2: Edward is older than  Robert.(false)
Distractor 3: Mary is older than  Susan.(false)
Distractor 4: NA(NA)
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An example of syllogistic reasoning item

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Arithmetic Questions:
Choose the best answer: 9 + 75 + 63 + 35 + 56 = ?
Choose the best answer: 4 + 78 + 90 + 53 + 36 = ?
Choose the best answer: 25 + 75 + 1 + 32 + 73 = ?
Choose the best answer: 89 + 62 + 86 + 41 + 16 = ?
Choose the best answer: 80 + 27 + 89 + 31 + 13 = ?
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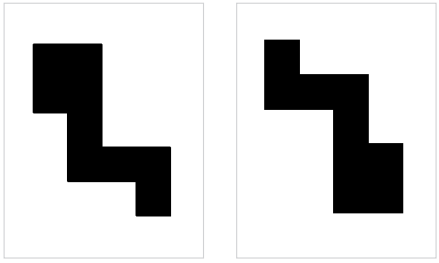
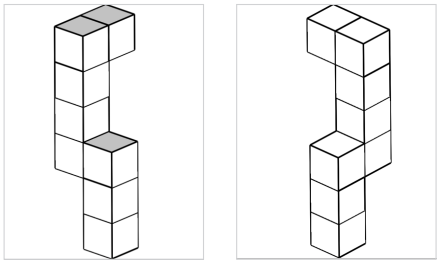
An example of arithmetic question



Display. Answer.

An example of a 2D spatial item with answer.



An example of a 3D reasoning item. An example of a 3D reasoning mirror item.