AUTOMATED TOUCHLESS LASER CUTTER FOR DRIED BLOOD SPOT DIAGNOSTICS

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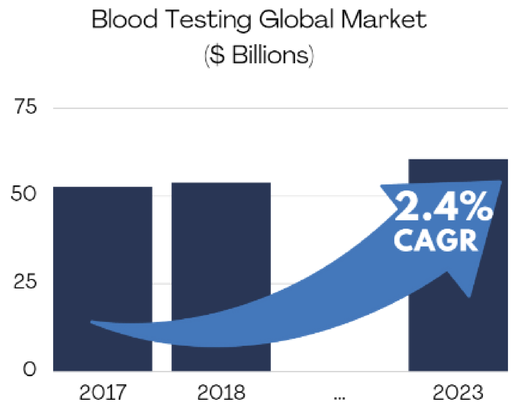
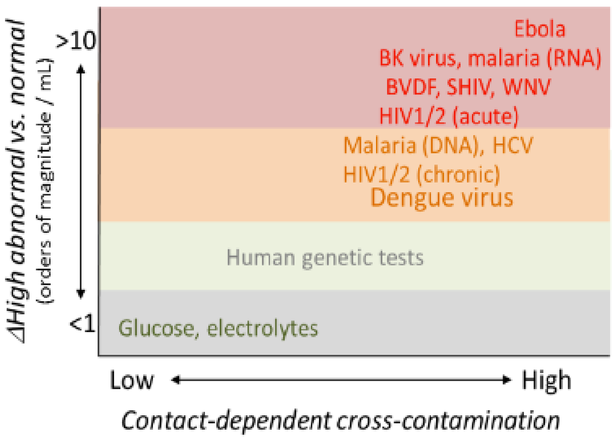
BACKGROUND

The global market for blood testing is growing and DBS sample collection is a cheap and popular solution used by many clinical studies around the world.



NEED STATEMENT

With current DBS sample collection procedures, there are high risks of sample contamination. This effect is amplified through post-collection processes including PCR.



SOLUTION

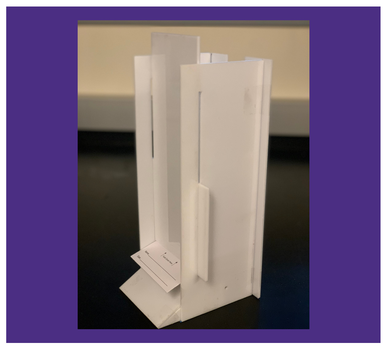
A **touchless and automated** laser cutting device for DBS that **eliminates cross-contamination**, without compromising **processing speed**.

Image Analysis

A camera captures an image of the sample cards which is decomposed into (red, green, blue) RGB values. Red values from RGB content are used to identify DBS samples. A ~12 mm diameter is drawn around the centroid of each DBS to use as a laser cutting template

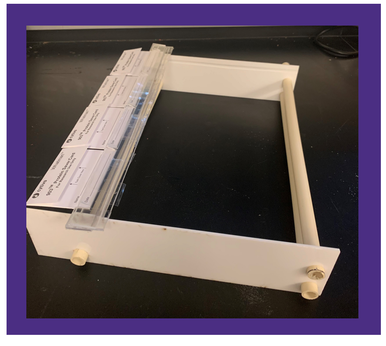
Card Feeding

Sample cards are fed into a card rack one at a time from a card feeder by a press of a button. This is accomplished by a DC motor which powers a wheel rotation in the card feeder to pass cards into a rack.



Card Rack

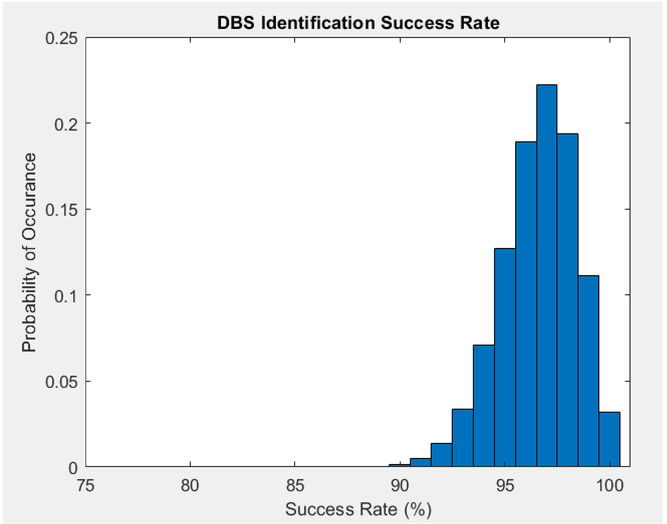
Rows of clear acrylic racks fitting a maximum of 4 DBS cards facing upwards will sit on top of a supporting frame waiting to be image processed and cut within the laser cutter.
Once a row is processed it will slide backwards so another rack will replace it.



Card Opening

A rotating arm parallel to the card rack will swipe towards the card flaps. The magnetic arm will push the magnetic ink applied on the card flap to create an opening and by rotating -270 deg. downwards it will guide the DBS cards to unfold.

RESULTS



Based on 177 DBS samples tested, we can say our DBS identification program can achieve at least a 92.8% success rate with 95% Confidence

FUTURE WORK

We hope to implement an automated all-in-one processor from card feeding to image capturing to sample collection and output. We will consider measures to expose multiple cutting surfaces at the same time so all card racks can be processed to boost productivity and to ensure the automated process can run unsupervised to reduce manual intervention.

SUPPORT

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Dr. Chris Neils | Professor of UW BioE
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