EXYPNOS
medical

Smart Urine Output Monitoring

The body speaks, if we listen.

www.exypnosmedical.com

Introduction

In a world of smart ICUs, there's one sign we still measure the old-fashioned way: **Urine output.**

Manual tracking can lead to **delayed interventions, errors,** and **increased workload** for medical staff.

Exypnos offers a solution: a contactless, automated system for accurate and continuous urine output monitoring.

Manual Methods Are Inadequate

Manual records deviate by ±20% from actual urine output, often missing early signs of kidney injury.

Catheter handling is the leading cause of CAUTI, responsible for over 35 % of hospital-acquired infections.

ICU nurses perform ≈ 18 manual bag checks per patient per day, adding workload and risk.

The process is inconsistent, delayed, and lacks real-time analytics, increasing both infection exposure and data loss.

Studies show manual records can be off by more than 20%, missing critical signs of kidney injury

Our Solution

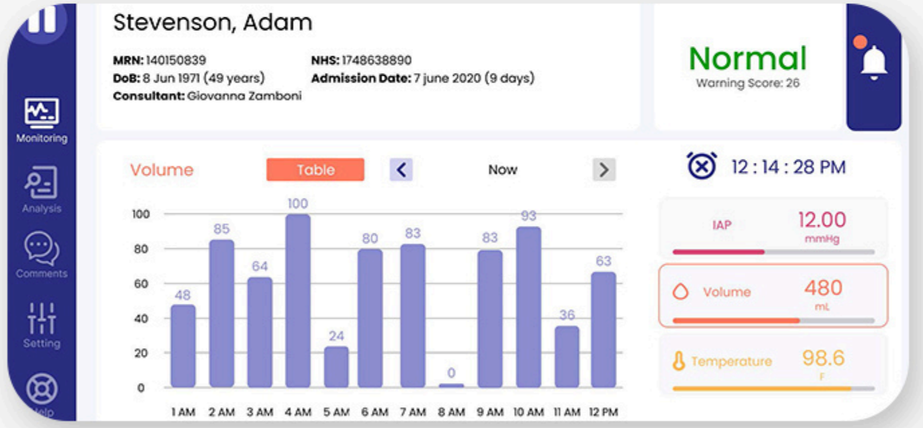
Exypnos UO Meter

Contactless optical device + intelligent dashboard

Key Metrics:

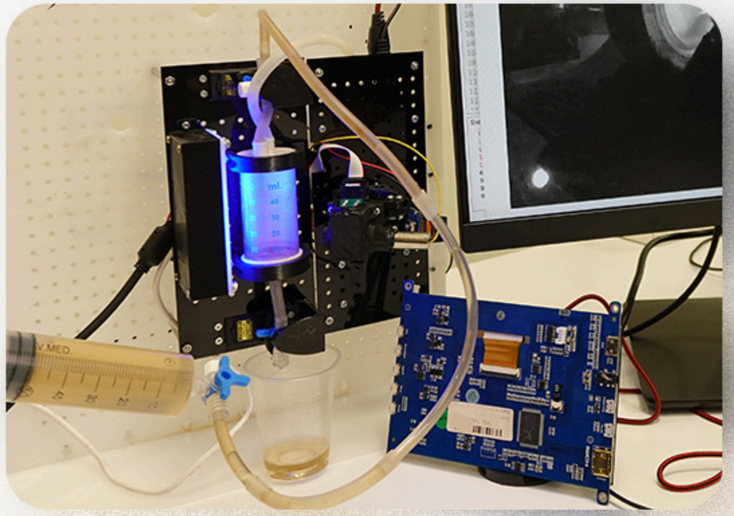
Volume accuracy
±1 mL vs lab reference

Turbidity R^2 = 0.93 vs spectrophotometer



Installed between the catheter & urine bag → records volume & clarity → AI engine detects anomalies → alerts nurses instantly

Product Features



- Automated, contactless urine monitoring
- Dashboard with real time data and customizable alerts
- Disposable, sterile collection chamber
- Real-time turbidity analysis via nephelometry
- Optical sensors for volume measurement
- Compatible with hospital and in-home setups
- No need for manual sampling or handling (Future plan)

Advanced Capabilities:

Early screening
Provides real-time insights into urine clarity to assist in identifying early signs of hematuria, dehydration, or infection risk.

Continuous Monitoring
Measures urine output and clarity automatically and with clinical accuracy.

Seamless Integration
Fits existing catheter systems without workflow disruption or retraining.

AI-Powered Insights (Future plan)
Predicts early signs of Acute Kidney Injury (AKI) and sepsis.

Reduced Risk & Workload
Minimizes contamination and manual handling, easing nursing effort.

Cost-Efficient & Scalable
Affordable unit pricing with low-cost disposables and SaaS-based expansion.

Competitive Advantages

Exypnos stands out by delivering a combination of clinical accuracy, hygienic operation, and data-driven functionality tailored to modern hospital needs.

Feature / Device	Sippi	Fize	Accuryn	Clarity RMS	Sensica	**Exypnos**
Volume Monitoring	Yes	Yes	Yes	Yes	Yes	**Yes**
Turbidity Measurement	No	No	No	No	No	**Yes**
AI-Based Analytics	No	Yes	No	No	No	**Yes** (Future plan)
Urine Analysis	No	No	No	No	No	**Yes** (Future plan)

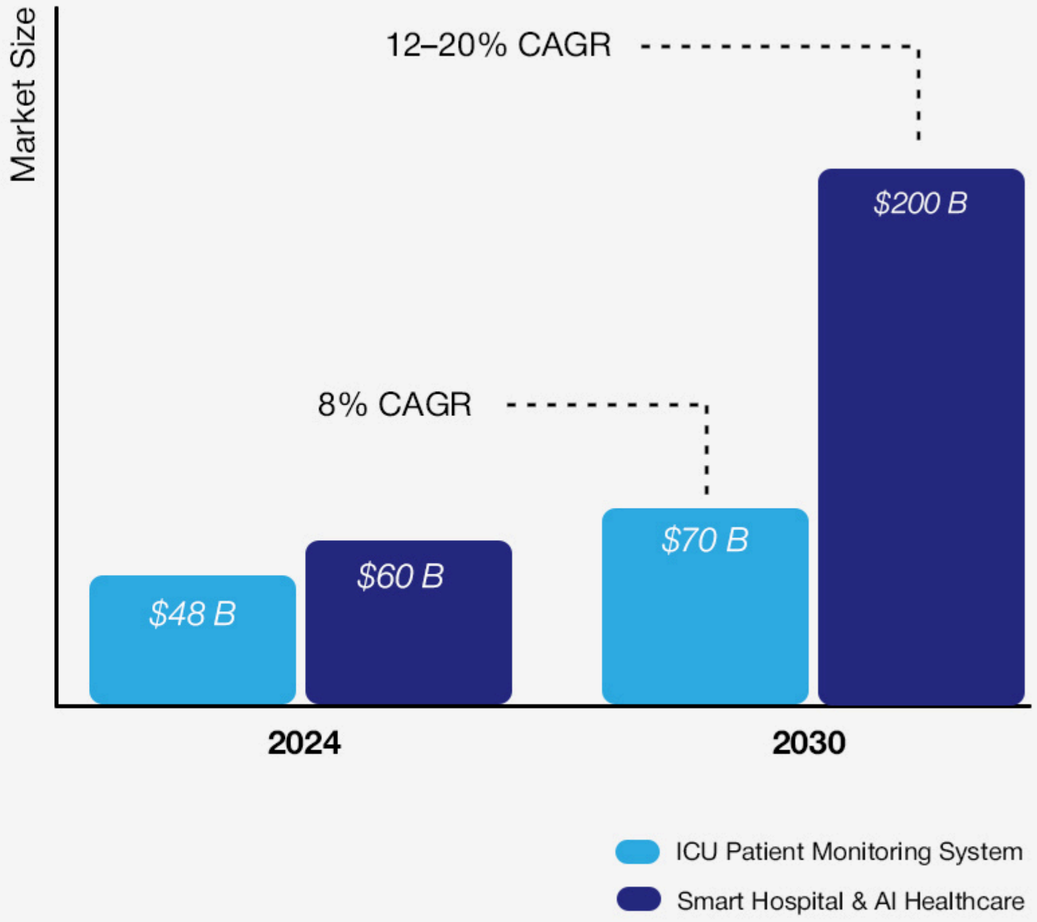
Market Opportunity

Exypnos operates at the intersection of two fast-growing healthcare markets

- ICU Patient Monitoring Systems
- Smart Hospital & AI Healthcare

Growth Drivers

- Aging population and expanding long-term care demand
- Widespread adoption of automated and digital monitoring systems
- Rapid advancements in computer-aided urinalysis technologies

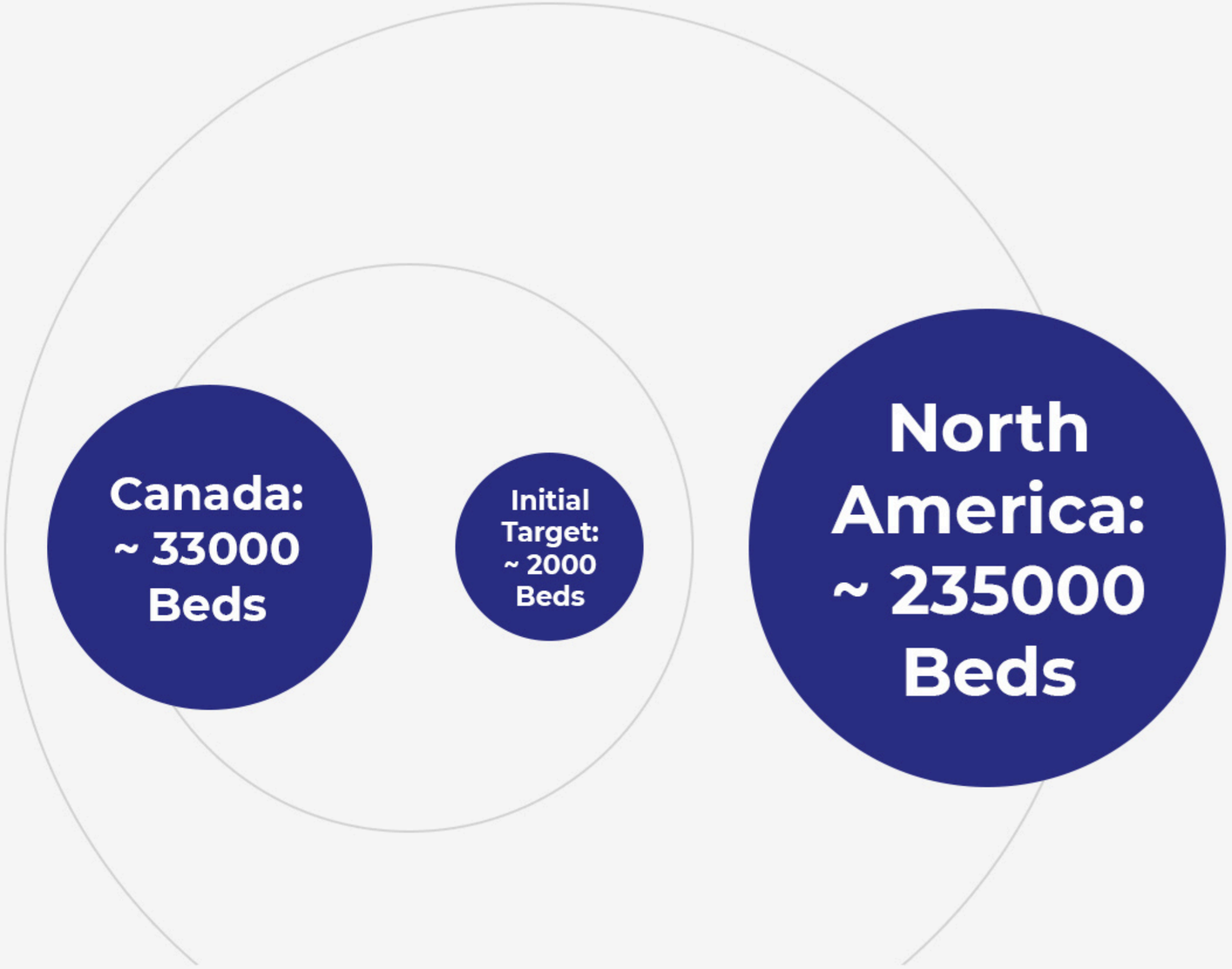


Clinical Applications & Addressable Market

The Exypnos UO Meter is designed for continuous urine monitoring across acute, long-term, and home-care setting, extending beyond ICUs to broader clinical applications.

Applications of Use

- Intensive Care Units (ICU, NICU, CCU)
- Surgical recovery and post-operative wards
- Long-term and elderly care facilities
- Trauma and burn units
- Home-care for chronic or renal conditions



Exypnos begins commercialization in Canada, focusing on ICU and LTC beds with the highest infection-control and automation priorities.

Revenue Streams

Hardware Sales
Selling Exypnos devices as a contactless, real-time urine monitoring solution.

SaaS Revenue
Subscription-Based Software Platform that provides real-time monitoring, alert systems, remote access, and AI-powered analysis.

Consumable Sales
Supplying single-use urine chambers ensure continuous consumable sales alongside device deployments.

Service & Maintenance
Offering training, technical support, maintenance, and future updates to ensure device reliability and customer satisfaction.

Meet Our Team

Mohammad Aliabadi
Chief Executive Officer

Founder of Exypnos
Master's in Photonics.
Oversees company strategy, product vision, and global market expansion.

Mina Mayeli
Chief Technology Officer

Electronics engineer leading the design and development of Exypnos's sensor systems and device hardware.

Hamideh Papi Namadi
Medical Director

Doctor of Medicine specializing in clinical application and workflow integration of the Exypnos system.

Ahmad Fakhravar
VP of Sales and Business Development

Finance expert. Manages external partnerships, institutional relationships, and market entry strategies in target regions.

Roadmap

2023 – 2024

- Finalized MVP0
- Completed bench testing & calibration.
- Initiated branding & outreach

2025 - 2026

- Finalizing MVP1
- Finalizing GUI & alert system
- Submit CIPO Patent

ISO

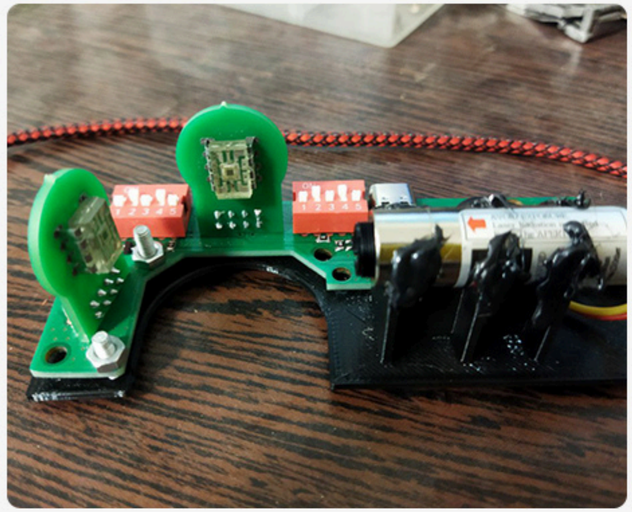
2026 - 2027

- Run Canadian clinical trials
- Pilot deployments in hospitals
- Submit Health Canada MDL

2028 & Beyond

- Start marketing campaigns
- Launch in Canada post-MDL
- Scale manufacturing & expand software services.

Achievements



Product Development

- 4 MVP versions completed (MVP0 & MVP1)
- Achieved ±1 mL volume accuracy and $R^2 = 0.93$ turbidity correlation in lab validation.
- Successfully tested +30 urine samples under real clinical conditions.

Academic & Clinical Collaborations

- Joint R&D with Ferdowsi University of Mashhad on optical sensing & nephelometry.
- Formal research partnership with Mashhad University of Medical Sciences (2024–2025) for clinical testing.
- Continuous feedback from physicians & hospital engineers guiding MVP refinements.

Recognition & Publications

- Two peer-reviewed papers accepted on turbidity analysis & optical sensing.
- Presented at the Optics & Photonics Conference (2025).
- Patent filed in Iran (2025); Canadian patent in preparation.

Appendices

We completed MTA accelerator program, gaining mentorship in business development and regulatory strategy.

MTA
MANITOBA TECHNOLOGY ACCELERATOR

As an active client in the MTA SUV program, it was a pleasure to see you so committed to building out your business and see your great progress throughout your time in the program.

In closing, please accept this note as one of congratulations on your progress and one of thanks for your consistent effort to build the business. Please accept this note of encouragement as you continue to grow the business creating jobs for Canadians and taxes for the Canadian government. It's been an absolute pleasure advising you over the last 18 months.

Yours truly,

Jenna Hnatishin
Chief Operating Officer
Manitoba Technology Accelerator

Additionally, we participated in the "Next Generation" event organized by PyCap in Dubai, where we presented Exypnos to international investors and startup leaders.

innovation venture farm

PYCAP

CERTIFICATE
OF PARTICIPATION

This is to certify that

EXYPNOS MEDICAL

has actively participated in the

"NEXT GENERATION"

conducted on 27 Agust 2023 at Dubai.

In acknowledgment of your active involvement, insightful contributions, and collaborative spirit throughout the **Global Fundraising Event to Boost Startup Enterprises**, we proudly present this certificate. Your commitment to exploring global investment opportunities and engaging in meaningful discussions has significantly enriched the overall experience for all participants.

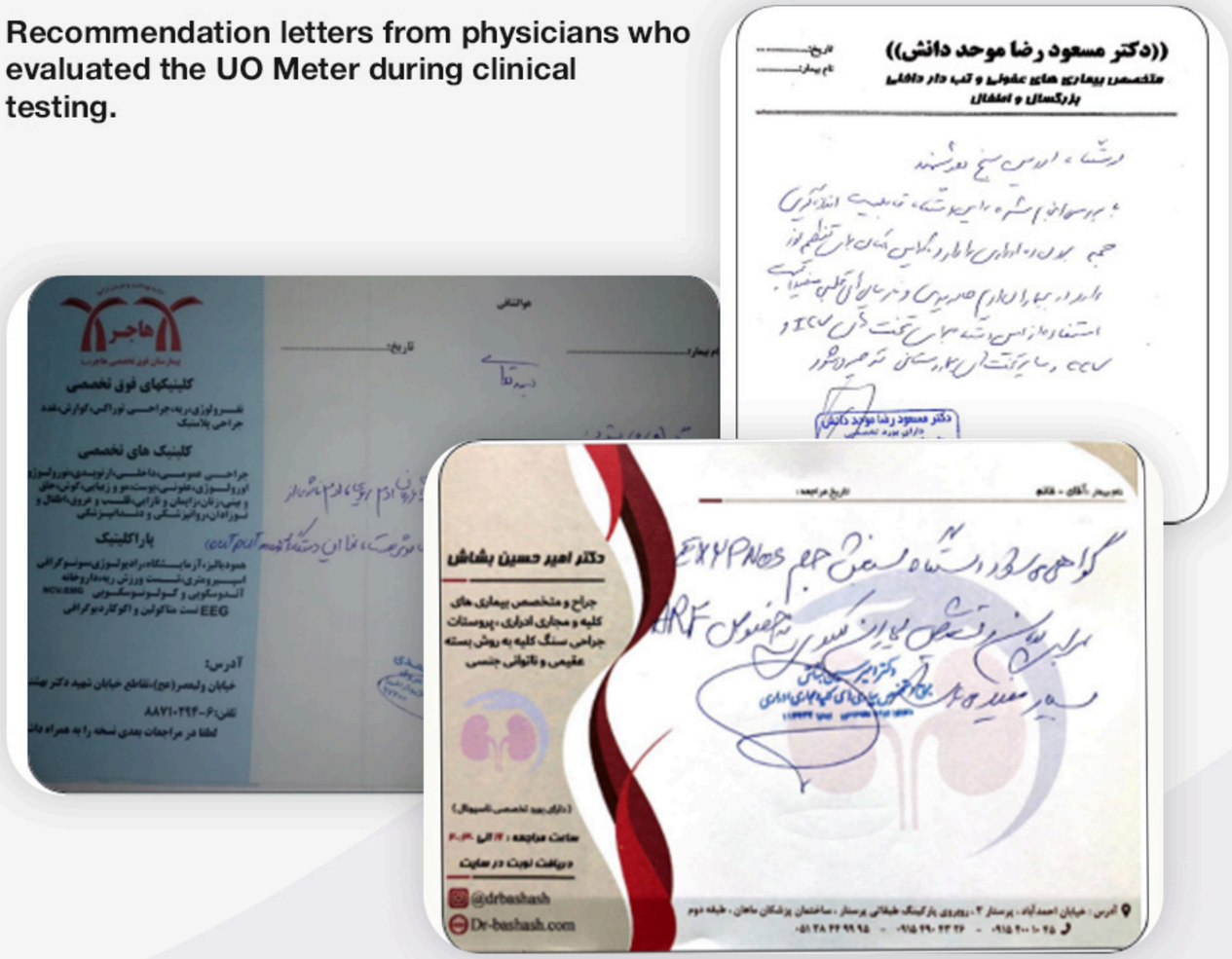
We express our gratitude for your valuable presence, dedication, and enthusiasm in making the event a resounding success.

M.Sanjari
Chief Executive Officer

DIFC

Appendices

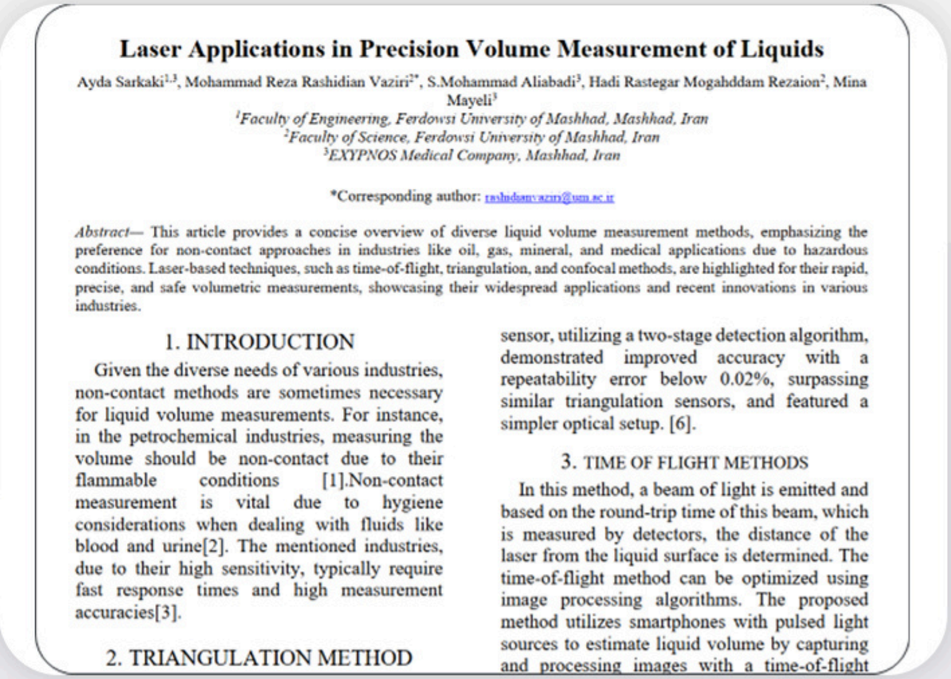
Recommendation letters from physicians who evaluated the UO Meter during clinical testing.



Patent application submitted to the Intellectual Property Center of Iran for official registration.

Appendices

Scientific publications and conference presentations based on the data obtained from our laboratory and clinical experiments.



Laser Applications in Precision Volume Measurement of Liquids

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Abstract— This article provides a concise overview of diverse liquid volume measurement methods, emphasizing the preference for non-contact approaches in industries like oil, gas, mineral, and medical applications due to hazardous conditions. Laser-based techniques, such as time-of-flight, triangulation, and confocal methods, are highlighted for their rapid, precise, and safe volumetric measurements, showcasing their widespread applications and recent innovations in various industries.

1. INTRODUCTION

Given the diverse needs of various industries, non-contact methods are sometimes necessary for liquid volume measurements. For instance, in the petrochemical industries, measuring the volume should be non-contact due to their flammable conditions [1].Non-contact measurement is vital due to hygiene considerations when dealing with fluids like blood and urine[2]. The mentioned industries, due to their high sensitivity, typically require fast response times and high measurement accuracies[3].

2. TRIANGULATION METHOD

sensor, utilizing a two-stage detection algorithm, demonstrated improved accuracy with a repeatability error below 0.02%, surpassing similar triangulation sensors, and featured a simpler optical setup. [6].

3. TIME OF FLIGHT METHODS

In this method, a beam of light is emitted and based on the round-trip time of this beam, which is measured by detectors, the distance of the laser from the liquid surface is determined. The time-of-flight method can be optimized using image processing algorithms. The proposed method utilizes smartphones with pulsed light sources to estimate liquid volume by capturing and processing images with a time-of-flight

Appendices

Scientific publications and conference presentations based on the data obtained from our laboratory and clinical experiments.

بسمه خدا

سی وپنجمین کنفرانس اپتیک وفوتونیک ایران وهفدهمین کنفرانس مهندسی وفناوری فوتونیک ایران

Real-Time Non-Contact Detection and Quantification of Urine Turbidity Using a Nephelometry Technique

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Research and Development department, Exypnos Medical, Mashhad, Iran[1]

Ferdowsi University of Mashhad, Mashhad, Iran[2]

Materials and Methods

The testing was conducted under sterile conditions, ensuring minimal contamination risk. Given the necessity for urine tests to be performed on fresh samples, all testing adhered to strict protocols to maintain sample integrity.

Figure 3. A representative urine sample for testing.

Result and conclusion

The findings of this study underscore the efficacy of our nephelometry-based device in the accurate detection and quantification of urine turbidity. In Figure 4, as the sample volume increases, the NTU also increases proportionally. This suggests that healthy urine samples become more turbid as the blood tested increases. The linear trend indicates a consistent behavior in healthy individuals. Indeed, for healthy individuals, the turbidity of urine tends to follow a predictable pattern. Any deviations from this trend might be indicative of underlying health conditions. In Figure 5 , the nephelometric results for a hematuria patient is shown. Like the healthy individual's graph, this one also shows an increasing trend of NTU with sample volume. Both graphs demonstrate that turbidity (NTU) tends to rise as the volume of urine tested increases. However, the NTU values in this hematuria case are likely significantly higher than those in the healthy individual's graph. Hematuria indicates blood in the urine, which contributes to increased turbidity. This explains the elevated NTU values. Clinicians can interpret this graph as abnormal due to the presence of blood, whereas the healthy graph represents expected behavior. The study findings revealed that the device effectively detected hematuria and accurately quantified its severity. Moreover, the device identified cases of hematuria that were imperceptible to the naked eye, demonstrating substantial NTU changes even when visually undetectable. Notably, the device exhibited a minimal systematic error of 2% and a standard error of 1.72 NTU, underscoring its precise quantification of urine turbidity and its low measurement error.

In conclusion, the device demonstrates a robust ability to detect urine turbidity of hematuria even at levels undetectable by the naked eye. Its real-time analysis and precise quantification of urine turbidity enable effective monitoring and comparison with an individual's baseline samples, allowing for detailed tracking of urinary changes over time. Notably, the device allows for intra-patient comparisons of nephelometric measurements, with numerical changes in turbidity potentially providing more accurate indicators for further clinical investigations. Beyond hematuria, the device shows promise for measuring other critical biomarkers such as albumin and creatinine. This advancement could

Introduction

Urine analysis includes both microscopic and macroscopic examination. Macroscopic urine analysis involves evaluating the odor, color, and turbidity of the urine[1,2]. The turbidity of urine can increase due to the presence of cellular debris, casts, crystals, and other particles. Substances such as blood (both red and white blood cells), hemoglobin, cholesterol, albumin, leukocyte esterase, nitrites, ketones, bilirubin, and urobilinogen, which are typically absent in urine, can also contribute to its cloudiness. Conditions like cystitis, diabetes, gonorrhea, chlamydia, kidney stones, pyelonephritis, urethritis, kidney failure, trichomoniasis, and prostatitis are linked to turbid urine. Other factors that can cause cloudy urine include hydration status, urinary tract infections, kidney infections and stones, sexually transmitted infections, vulvovaginitis, diet, and diabetes.[3-5] Monitoring urine parameters such as volume and turbidity becomes even more crucial after surgical procedures [6,7]. Currently, urine turbidity is measured visually, and if any turbidity is observed, the samples are sent to clinical laboratories for further examination, which is a time-consuming process (Figure 1). Low levels of turbidity are not detectable by the naked eye. Changes in urine turbidity can indicate various issues, as previously mentioned, and continuous monitoring of these parameters can simplify the screening process. Given the importance of measuring urine turbidity, Padilla and colleagues designed a device that detects urine turbidity using a turbidity sensor and an Arduino board. This test device was specifically designed for male urinary system [8] This model quantitatively measures urine turbidity, but it uses a contact method that is not feasible for use in a hospital environment. Mithya et al. proposed using an Arduino-based device to measure turbidity in liquids, including urine. The Arduino turbidity sensor functions like a photometer, detecting suspended particles by measuring transmitted and scattered light [9] In this study, urine turbidity was quantified once again; however, due to the contact- based method and the requirement for sterility, it is not feasible for use in clinical settings. This device is based on scattering and has an error limit of two percent. Its innovation lies in employing a non-contact and Real time method for measuring urine turbidity through nephelometry and quantifying urine turbidity and hematuria for screening and diagnosis. Accurate measurement of urine turbidity can facilitate future research and development.

Figure 1. A sample of a hematuria case under the microscope

Thank You!

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