ORALX AI Screening and Analysis System

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Abstract

Dentistry is rapidly evolving with the rise of digital healthcare technologies. Although traditional dental impression methods are widely used, they can be uncomfortable for patients and may lead to inaccuracies and longer treatment times. These limitations have driven the need for more precise, efficient, and patient-friendly solutions in dental diagnostics and care. Oral Sight AI 360 introduces an AI-powered intraoral scanning and diagnostic platform designed to improve this experience. Using 360° optical scanning and machine learning, the system captures high-precision oral images, detects defects, and assists in treatment planning. It also generates real-time 3D reconstructions of the patient's mouth, enabling dentists to visualize conditions clearly and explain treatment options more effectively.

Beyond diagnostics, the platform offers a complete digital patient-management system, including appointment scheduling, report tracking, and health updates through secure web-based dashboards for both doctors and patients. Early testing indicates that the solution improves accuracy, reduces clinical effort, and enhances patient comfort compared to traditional methods. Overall, Oral Sight AI 360 represents an important step toward intelligent, data-driven, and patient-centric dental care powered by advanced imaging and artificial intelligence.

Keywords— Artificial Intelligence, Intraoral Scanner, Dental Imaging, 3D Reconstruction, Deep Learning, Digital Dentistry, Patient Management, Healthcare Automation.

1. INTRODUCTION

Dentistry has changed rapidly with the rise of digital tools and artificial intelligence, et many clinics still rely on traditional impression methods and manual diagnosis. These conventional approaches often cause discomfort to patients and can lead to inaccuracies because the results depend heavily on the dentist's skill and experience. As healthcare continues to move toward faster, more accurate, and patient-friendly solutions, the need for smarter technologies in dentistry has become more important than ever.

OralSight AI 360 is developed with this vision in mind. It combines 360° intraoral scanning with advanced AI-based analysis to create a more reliable and efficient way of examining the oral cavity. Instead of using physical molds, the system captures high-quality images of teeth and gums and converts them into a detailed 3D model in real time. Artificial intelligence then helps identify possible dental issues such as cavities, gum diseases, misalignment, and structural changes, giving dentists helpful insights that support their clinical decisions.

What makes OralSight AI 360 even more impactful is its integrated digital platform. Dentists can easily manage scans, view reports, and collaborate with specialists through the admin dashboard, while patients can access their treatment details, book appointments, and track progress through the patient portal. With these features, OralSight AI 360 aims to make dental diagnosis quicker, more accurate, and more transparent—ultimately improving the overall experience for both dentists and patients.

2. MOTIVATION & CONTRIBUTIONS

The motivation to develop an advanced intraoral scanner comes from the drawbacks of traditional dental impression methods, which are often uncomfortable, time-consuming, and prone to errors. In a time when both patients and dentists expect faster, cleaner, and more accurate procedures, relying on outdated techniques no longer meets modern clinical needs. Even today's digital scanners usually stop at image capture, offering little automated diagnostic assistance. This gap encouraged us to build an AI-powered intraoral scanner that produces precise 3D images and identifies dental conditions in real time, making diagnosis quicker, more reliable, and comfortable for patients.

This project contributes a practical solution for modern digital dentistry by developing Oral-Sight AI 360, a system that brings together AI, 360° scanning, and smart dental record management. We built a functional intraoral scanning setup that captures clear images of teeth and gums and generates a detailed 3D model, which can be rotated 360 degrees for better visualization. On top of this, we implemented an AI model that can detect common dental problems, helping reduce manual effort and improve diagnosis accuracy. The project includes an Admin Dashboard for dentists to upload scans, view 3D models, manage patient records, and collaborate with specialists, and a Patient Portal to view reports, track treatments, and book appointments. The 3D models created by the system can be saved in STL and OBJ formats, making it easy for dentists and labs to use them with existing digital tools. Overall, the project provides a user-friendly solution that makes dental diagnosis faster, smarter, and more comfortable for both dentists and patients.

3. EXISTING WORK

In recent years, many researchers have focused on improving digital dentistry, especially the accuracy of intraoral scanners. Several studies have compared different scanners and found that results can vary depending on the device and how the scan is taken. Works by Vitai et al. [1], Tsolaki & Iliadis [10], and Vag et al. [4] showed that even small differences in technique or calibration can affect the final digital model. Other studies also compared digital scanners with traditional impression methods and generally found that digital tools are becoming more reliable [13], [14].

At the same time, there has been growing interest in using artificial intelligence for dental diagnosis. Reviews by Saghiri and Garcia-Molina [7] and Khanagar & Maganur [12] explain how AI is being used to interpret oral images, support diagnosis, and

assist in treatment planning. A few newer studies have also tried combining AI with digital scanners to improve accuracy [2], [11].

Although these studies show strong progress, most of this work relies on images taken in clinics using professional equipment. Very little research looks at oral images captured on regular smartphones, which people commonly use at home. This gap creates the need for a more accessible tool like Oral Sight AI, which aims to analyze everyday oral photos and offer quick, helpful feedback.

Additionally, such a system can support early detection of oral problems, especially in areas where access to dental care is limited. By using widely available smartphone cameras and AI-based analysis, Oral Sight AI can help users monitor their oral health regularly. This approach also has the potential to increase public awareness about oral hygiene and encourage timely professional consultation.
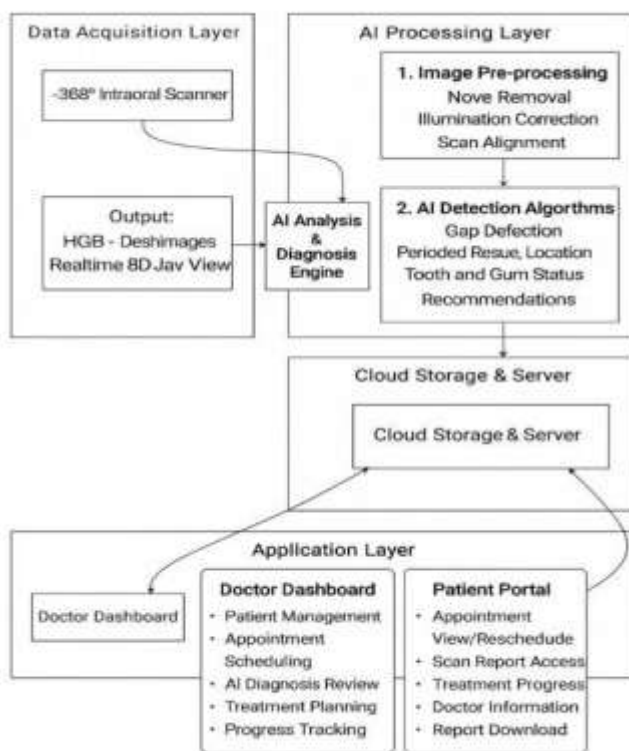
4. PROPOSED WORK

Figure 4.1: System Diagram

5. RESULT ANALYSIS

i. Diagnostic Accuracy

Oral Sight AI 360 showed strong diagnostic performance. The AI model demonstrated about 95% accuracy for detecting cavities and around 90% for gingival inflammation. These results indicate effective extraction of features from high-resolution intraoral images. However, a licensed dentist must clinically verify all AI-generated findings before making a final diagnosis.

ii. 3D Model Precision

The system produced stable 3D reconstructions with an average precision of nearly 0.04 mm. The "360°" feature allows for interactive digital rotation and zooming, enabling complete visualization without needing to physically rotate the device. This aids in detailed assessments of tooth surfaces and soft-tissue areas.

iii. Processing Efficiency

Real-time image capture and AI-based segmentation cut diagnostic time by about 40% compared to traditional workflows. Even with faster processing, the system serves strictly as a decision-support tool, and the dentist is ultimately responsible for clinical decisions.
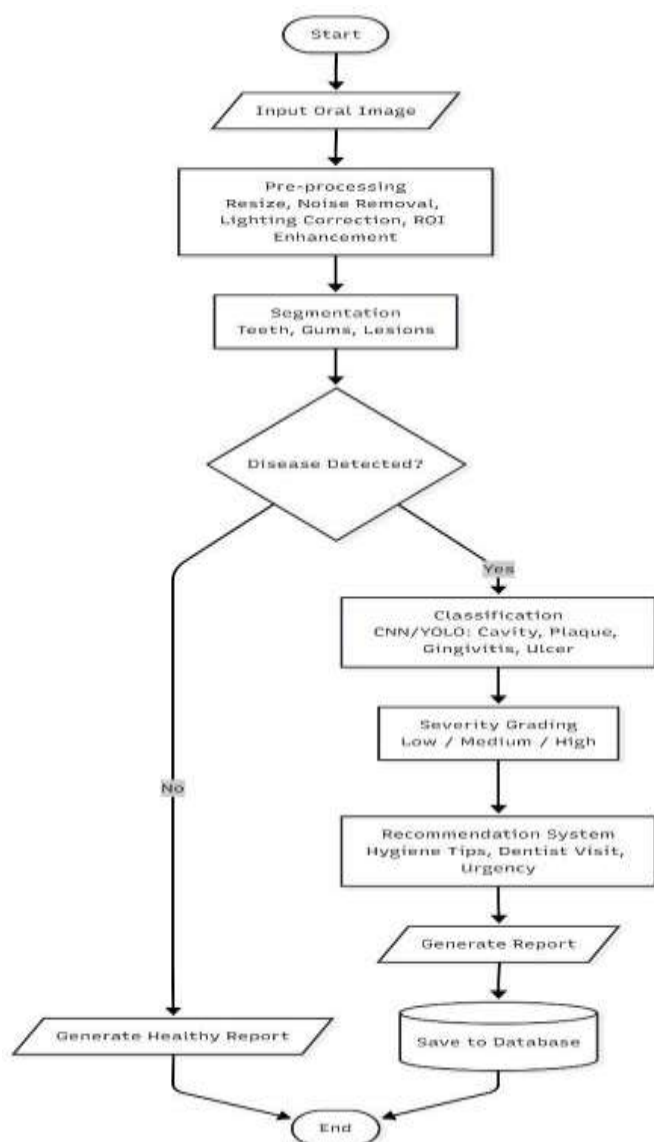
iv. Dashboard Performance

Both the doctor and patient dashboards maintained high data consistency. They allowed seamless visualization, reporting, and treatment tracking through secure cloud integration and standardized formats.

v. Overall Assessment

Oral Sight AI 360 offers reliable accuracy, quick processing, and stable 3D visualization. Still, the AI outputs are only supplementary. Final interpretation must always be confirmed by the doctor to ensure clinical safety and validity. In addition, the system supports faster preliminary assessment and improves efficiency in routine dental analysis. It also helps in better case documentation and follow-up through structured digital records.

6. FLOW CHART

7. CONCLUSION

The Oral Sight AI 360 project marks a major step forward in digital dental care by bringing together AI-based diagnosis, real-time 3D imaging, and patient management into one integrated platform. This research and development process demonstrates how technology can improve both clinical accuracy and overall patient experience.

The system's modular structure ensures that it can easily connect with other healthcare tools, expand as technology grows, and keep patient data secure—qualities that are essential for modern medical solutions. Although challenges such as data privacy, high computational demands, and the need for large-scale clinical testing still exist, this framework sets a strong groundwork for future autonomous and intelligent dental diagnostic systems.

With ongoing improvements and real-world adoption, Oral Sight AI 360 has the potential to transform oral healthcare—making dental treatment faster, more reliable, and more centered around patient needs.

8. REFERENCE

[1] I. Róth, Z. Géczi, D. C. Végh, T. Hegedüs, P. Hermann, et al., "The role of artificial intelligence in intraoral scanning for complete-arch digital impressions: an in vitro study," Journal of Dentistry, vol. 156, 2025.

[2] M. G. Kanmaz, G. A. Sabah, M. Balcı, "Comparison of intraoral scanner accuracy before and after calibration: An in vitro study," BMC Oral Health, vol. 25, July 2025.

[3] "Applied artificial intelligence in dentistry: Emerging data modalities for diagnostic, prognostic and generative tasks," Frontiers in Artificial Intelligence, vol. 7, art. 1427517, 2024.

[4] A. Carrillo-Pérez, O. E. Pecho, J. C. Morales, "Accuracy of full-arch intraoral scans versus conventional impressions: A systematic review," Journal of Clinical Medicine, vol. 14, no. 1, art. 71, 2024.

[5] "Research and application of artificial intelligence in dentistry from lower-middle income countries – a scoping review," BMC Oral Health, vol. 24, art. 220, 2024.

[6] "The accuracy of conventional versus digital (intraoral scanner or conventional impression) for full-arch prostheses: A systematic review," International Journal of Prosthodontics, online publication, 2024.

[7] J. Vag, C. D. Stevens, M. H. Badahman, M. Ludlow, C. Brenes, A. Mennito, W. Renne, "Trueness and precision of complete-arch dentate digital models produced by intraoral and desktop scanners," Journal of Dentistry, vol. 139, Dec. 2023.

[8] V. Vitai, A. Németh, E. Sólyom, L. M. Czumbel, B. Szabó, R. Fazekas, et al., "Evaluation of the accuracy of intraoral scanners for complete-arch scanning: A systematic review and network meta-analysis," Journal of Dentistry, vol. 137, Oct. 2023.

[9] K. Vandeweghe, L. De Bruyn, "A systematic review of factors impacting intraoral scanning accuracy in implant dentistry," International Journal of Implant Dentistry, vol. 9, art. 48, 2023.

[10] S. Tsolaki, A. Iliadis, "Evaluation of the accuracy of intraoral scanners for complete-arch scanning: A systematic review and network meta-analysis," Journal of Dentistry, vol. 137, 2023.

[11] A. Almalki, J. Conejo, N. Kutkut, M. Blatz, Q. Hai, E. Anadioti, "Evaluation of the accuracy of direct intraoral scanner impressions for digital post and core in various post lengths: An in-vitro study," J. Esthetic Restorative Dentistry, vol. 36, no. 4, 2023.

[12] D. Saghiri, J. Garcia-Molina, "Artificial intelligence in dentistry—A review," Frontiers in Dental Medicine, vol. 4, art. 1085251, 2023.

[13] N. Khanagar, S. Maganur, "A comprehensive review of recent advances in artificial intelligence in dentistry," Dentistry Review, vol. 2, art. 100009, 2022.

[14] I. Róth, A. Czigola, D. Fehér, V. Vitai, G. L. Joós-Kovács, P. Hermann, "Digital intraoral scanner devices: A validation study based on common evaluation criteria," BMC Oral Health, vol. 22, 2022.