

SÃO PAULO STATE UNIVERSITY
School of Engineering of Ilha Solteira

TITLE



Research Report – Iniciação Científica

Student: Gabriel D. Silva

Professor: Douglas D. Bueno

UNESP
Ilha Solteira – SP
2022

RESEARCH REPORT

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut pulvinar rhoncus dapibus. In orci odio, elementum vitae eros nec, rhoncus mattis ante. Proin vitae magna feugiat, facilisis enim nec, faucibus ante. Nullam rhoncus est ac odio sodales, et congue purus varius. Pellentesque nec ligula ante. Nunc volutpat nunc sit amet leo tempor consequat. Nulla et lectus id nisl pharetra aliquet ac quis tellus. Integer quis dictum nibh. Morbi ut nunc a quam fringilla commodo nec vitae tellus. Suspendisse tristique vel nisl vitae ornare. Aliquam a imperdiet dui. Phasellus a rhoncus mi. Quisque condimentum lacus velit, quis aliquet risus cursus non.

Keywords: word, word, word.

LIST OF FIGURES

LIST OF TABLES

CONTENTS

List of Figures	ii
List of Tables	iii
1 Introduction	1
1.1 Objective	2
2 Methodology	3
2.1 Railway	3
2.2 Crack Detection	3
Bibliography	4

1 INTRODUCTION

Unnamed Aerial Vehicle (UAV) has been used for several applications, such as entertainment, sports transmissions and commercial applications. However, historically, it was primarily designed to achieve military goals, including unmanned inspection, surveillance, reconnaissance, and mapping of inimical areas. Over time, its applications extended to other areas, like geomatics, for data collecting through photogrammetry. This way, collecting images using UAV provides a bunch of applications in the aerial close-range domain, making it a low-cost alternative to the traditional manned aerial photogrammetry for mapping or detailed 3D recording information and being a valid complementary solution to terrestrial acquisitions (5).

In Brazil, UAV is widely used in agricultural situation, therefore, tracking, monitoring and collecting information in real time from remote areas for agriculture and livestock are quite relevant. Abade et al. (1) showed the development and construction of an UAV able to board remote sensing applications with images and radio frequency for this purpose. Still with the same bias, but targeting another aspect, Otake (6) used UAV to generate cartographic products for agriculture purpose. The main goal was to detect failure of planting, the projection of contour lines and the elaboration of use of soil map.

In such manner, the use of UAV equipped with cameras to access places where human access might be difficult is a way to spend less effort in many contexts, decreasing the chances of accident and spare financial recourses. Dadrasjavan et al. (3) considered the use of UAV useful for acquiring reliable information about the pavement of the road and monitoring any kind of crack on it by selecting key frames and generating ortho-image. Non road regions in the scene are discarded and crack elements are extracted. Subsequently, through Support Vector Machine (SVM) classification true cracks are detected. On the other hand, Sushant et al. (7) used a MATLAB® implementation to both localizing the position of the UAV and detect cracks in railway tracks. For the first goal, a Monte Carlo Localization (MCL) method was carried out for the software senses its position and for the second goal, and software method was able to detect the railway cracks comparing the intensity of the color of the image. Lesiak (4) also bring the attention to the inspection and maintenance of railway infrastructure with the use of UAV and its implementation.

Hence, it's clear the demand of UAVs in various sceneries, in special to assist detecting damages in specific types of structures. Not only understand and determine the method is crucial, but also the way that it's implemented and its viability.

1.1 Objective

To develop a process to obtain and analyze aerial images to detect railway cracks.

2 METHODOLOGY

2.1 Railway

The human being always needed to move from one place to another. Since prehistory, either to run away from a predator or to obtain food, it's intrinsic to the humanity the idea to get out of point A to a certain point B. As the evolution was passing, many couldn't keep themselves alive due to the sagacity of the predator, so a way to contour this was to improve the means of transportation.

Today, one of the most used means of transportation is train. Highly used around the world to transport people as well as products, trains are one of the most important ways to get things from one place to another.

2.2 Crack Detection

There are three main ways to detect cracks: graphical inspection, non-destructive testing technologies and shuddering based global methods (2). The UAV usage for this purpose fits in the first way, i.e., graphical inspection.

To have a complete approach, it is needed to localize the UAV initially. Sushant et al. (7) implemented a way to do it based on MCL method through MATLAB, where a three element vector (x, y, θ) is provided giving the initial pose.

IMAGE

BIBLIOGRAPHY

- [1] Abade, A., de Campos, M. D., Porto, L. F., de Farias Coelho, Y., de Moura Sousa, Y. and Nespolo, J. P. (2016), 'A construção otimizada de um drone para aplicações na agricultura e pecuária de precisão', *Anais da Escola Regional de Informática da Sociedade Brasileira de Computação (SBC)–Regional de Mato Grosso* 7.
- [2] Addagatla, P. and Koteswar Rao, G. (n.d.), 'A modern method for detecting cracks in railway tracks by the efficient utilization of ldr and led system', *Int J Eng Sci Invention* .
- [3] Dadrasjavan, F., Zarrinpanjeh, N. and Ameri, A. (2019), 'Automatic crack detection of road pavement based on aerial uav imagery'.
- [4] Lesiak, P. (2020), 'Inspection and maintenance of railway infrastructure with the use of unmanned aerial vehicles', *Problemy Kolejnictwa* .
- [5] Nex, F. and Remondino, F. (2014), 'Uav for 3d mapping applications: a review', *Applied geomatics* 6(1).
- [6] Otake, V. S. (2017), 'Produtos cartográficos gerados a partir de drones e aplicações na agricultura'.
- [7] Sushant, S., Anand, S., James, T., Aravind, V. and Narayanan, G. (2017), Localization of an unmanned aerial vehicle for crack detection in railway tracks, in '2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI)', IEEE, pp. 1360–1365.