Automated Electronic System for Census Process

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ABSTRACT

Present-day censuses are generally completed in physical modes wherein the authorities need to go from door to door to gather the necessary information. All the Censuses to date have been directed similarly, and in this way require a ton of on-ground authorities for the same. Likewise, a ton of desk work is needed to have been kept up within this interaction making it a bulky interaction. There have been ongoing advancements in having an application for completing the Census, yet even that has numerous limits. Since for this situation individuals can get to the application and give the responses all alone, it can prompt off-base or deceiving information bringing about the failure of the reviews. Likewise, not all individuals can utilize portable applications with no help. Also, it has been referenced in the Lok Sabha that over 25000 villages in India still lack mobile and internet coverage. Because of this absence of web entrance in distant regions, the past conventional techniques for taking overviews are still in practice. Hence, in this paper, we introduce a new approach, an Automated survey system for the census process. The proposed system is faster and more authentic than the traditional process of pen and paper. All the data is collected digitally and stored directly into datasets, therefore data storage and retrieval are no longer cumbersome. This collected data is far easier to analyze. The authenticity is provided by Biometric sensors.
Keywords—Census, survey, biometric sensor

1. Introduction

The Census Report of India states that "Population census is the total process of collecting, compiling, analyzing or otherwise disseminating demographic, economic and social data pertaining, at a specific time, of all persons in a country or a well-defined part of a country. As such, the Census provides a snapshot of the country's population and housing at a given point of time." It is basically an authority count through an immediate visit to every individual who is actually present and dwelling routinely or briefly in the country at a given mark of time. Enumeration is an exceptional strategy for an assortment of demographic information. Consequently, it should be gathered from the ideal individuals and be valid. Traditionally, there are two main census methods. The first is the De-facto method wherein a date is fixed for the statistics of the entire country. Typically, such a De-facto method of the census was carried out till 1931. The second method is the De-jure method in which all people who normally live in a country/domain at a specific reference time-point (generally taken as the center of a year) are considered to be the number of inhabitants of the particular area. The specification work is spread over half a month which is known as the enumeration period.

Census, in its present logical structure, was directed non simultaneously somewhere between 1865 and 1872 in various parts of the country. This work coming full circle in 1872 has been prevalently marked as the principal Census of India. However, the first synchronous Census was completed in 1881. A solid chain of censuses from that point forward gives the Indian Census a remarkable chronicled inheritance unrivaled on the planet. Presently the Census of India is conducted once in 10 years, following an extended de facto canvasser method. Under this methodology, information is gathered from each person by visiting the family and peddling the survey all around the country, over

a period of three weeks. The count is then revived to the reference date and time by driving a Revisional Round. In the Revisional Round, changes in the sections that emerge by virtue of births, passings, and relocation between the hour of the enumerator's visit and the reference date/time are noted down and the record is refreshed. The enumeration has various officials allotted the obligation at various levels to complete the assignment. Census 2011 was the fifteenth Census in this ceaseless series since 1872 and the seventh since Independence. The 2021 census has been delayed to 2022 due to the Covid-19 pandemic.

1.1 Literature Survey

As of 2011, the decennial Census of India has been conducted multiple times. While it has been attempted like clockwork, starting in 1872 under British Viceroy Lord Mayo, the principal complete enumeration was taken in 1881. Post-1949, it has been directed by the Registrar General and Census Commissioner of India under the Ministry of Home Affairs, Government of India. All the censuses starting around 1951 were directed under the 1948 Census of India Act. The last enumeration was held in 2011, while the following was to be held in 2021 but has been delayed because of the COVID-19 pandemic.

Raghavendra Yadav[1], in his paper, "Trends and structure of census method in India", discusses the strength and the weakness of the census of India. It endeavors to be a signpost towards improvement in the efficacy of future census data collection. It also focuses on the functions of the census Bhaswati Das and Dipendra Nath Das[2], highlight the changes in terms of the content and coverage and the steps towards modernization of the census in India. Their paper "Indian census: Past and present" compares the pre and post-independence methods of the census and stresses the changes made in the Indian census since its inception with special emphasis on the 2001 census.

Ankush Agarwal and Vikas Kumar[3], in their research article, "Delays in the release of India's census data", examine the growing time gap between the enumeration and the release of the census data in India amidst technological advancements. The quality of Indian census data from the perspective of timeliness was examined and it has been indeed noticed that delays have grown rather than reduced over time despite technological innovation and growing field experience.

Bernard Bafour[4], in his article, "The Modern Census", talks about the issues that emerge and the job of the advanced evaluation within the public measurable framework, and how at last, these concerns boil down to compromising between various elements of quality.

Murali Dhar Vemuri [5], in his paper, "Data collection in Census", underlined the importance of the census and the errors that occur during the analysis of the data collected. He has also provided a framework for the evaluation of measuring errors while additionally examining the outcomes of the 1981 survey based on the framework presented.

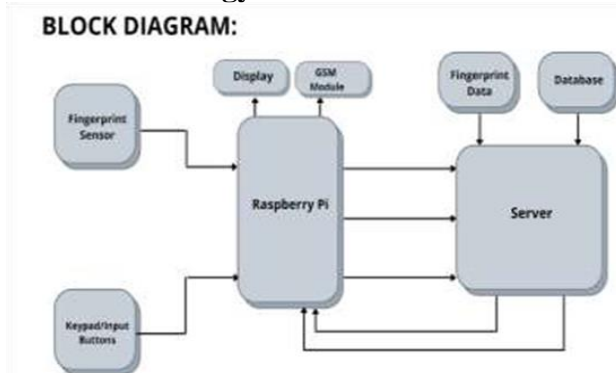## 2. Experimental Methods or Methodology

Fig.1 Block Diagram of the Proposed System

Fig.1 addresses the plan of the Biometric based electronic machine for conducting surveys.
Modules like Fingerprint sensor, Keypad, and GSM are connected with Raspberry Pi. A data set is made for storage, update, and recovery of information. The Survey incorporates the following stages:
Authentication: For the check cycle, a unique finger impression module interacts with Raspberry Pi which will catch the finger impression and confirm with the records in the information base.
Survey Response: Once the confirmation is done, the review interaction starts wherein the rundown of questions is shown and the citizen needs to enter the responses through the keypad.
Storage of Data: A web information base server is made to store the gathered information which can be handled later.
Confirmation: After all the questions are answered, the person receives a confirmation message on his/her mobile.

The proposed framework uses the following major components:
1. Raspberry Pi: Raspberry Pi 4 has a quad-core processor with various sizes of RAM. There are two mini HDMI ports, four USB ports for serial communication, and two ports for two 4K displays. It has an operating voltage range of 5 volts with 3 amperes minimum current rating. 28 GPIO ports (General Purpose Input Output) are available to communicate with the devices.
2. GSM: The GSM module offers GPRS/GSM technology communication with the users of a mobile sim. It allows users to receive or send mobile calls and SMS. It is controlled via AT commands such as CSMS(for selecting message service), CMGS(for sending messages), etc.
3. Fingerprint Sensor: It captures the fingerprints of an individual, matches them with the stored records, and verifies the citizen.
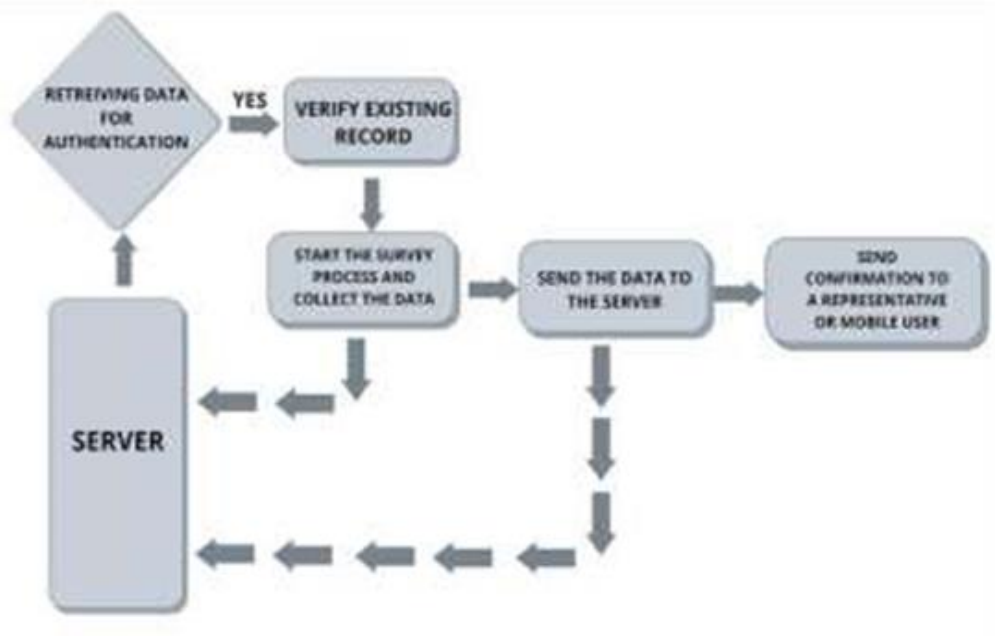

Fig.2 Flow Chart for the Proposed System

Fig.2 depicts the flow of the proposed system. It consists of the following steps:
Step 1: We begin with the authentication process and verify the citizen in view of the information present in the server.
Step 2: If the verification is successful we proceed with the survey.
Step 3: The list of survey questions is displayed on the screen one at a time.
Step 4: The responses entered by the citizen through the keypad are then stored on the server and can be easily accessed for further processing.

Step 5: Once, all the questions are answered it asks for the person's mobile number.
Step 6: The GSM module sends a confirmation to the mobile number after storing all the responses successfully.

Results and Discussion
After integrating all the components as in the block diagram a test was recorded. The data retrieved from the user was stored in a csv (comma separated values) file which could then be converted to excel format for easy analysis.

CONCLUSION
The proposed framework is a huge improvement over the traditional methodology of pen and paper. The overall cost required for the census process is reduced. The time taken to collect and analyze the data is also reduced. Every entry is unique and authentic with the added biometric authenticity. The system is made user-friendly for the end user and the representative, making it easier to collect the data. The data collected from the survey is uploaded to the server which can make the analysis far easier than manual labor.

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