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Statistical Signal Processing Application of on Line Examination and Result Publication in Organization using Algorithm

Ghanashyam Rout, Jibendu Sekhar Roy

Abstract*: Online examination is performed through the internet or intranet using computer. It is an effective conducting and evaluating solution for examination process in organization. Online examination process is developed based on MAT LAB which carries out the examination evaluation and result publications offer greater flexibility than the traditional examination pattern. The main purpose of examination is that generating multiple choice tests, database design, software implementation of a multiple choice examination and is better idea to make an online interface for evaluation. Performance of the proposed algorithm is estimated by using statistical signal processing based on students data and by computing average value, standard deviation (SD), signal-to-noise ratio (SNR), coefficient of variance (CV) and typical error (TE). It is assumed that organization authority manages the institutional resources and the academic and administrative services in such a manner that a large number of students can appear the examination without any hazard inside the own organization safely and properly used.

Keywords*: Online Examination System, Auto-grading, Information System, Auto-grading, Web-based, Online Evaluation, Multiple Choice Examination.

I. INTRODUCTION

Online examination has become an effective complement to give fairness of examination due to the development of Internet technology. Examination authorities, lecturers and examiners have to adapt the online examination easily. Conducting of online examination system is allow in institution through the internet (or intranet)which is quicker, easier, evaluated automatically, reduce the required time, diminishing the need for paper, less manpower, obtain fast, accurate results and prepared the result sheet report properly. To implement free text analysis, mouse action analysis models in theoretically and experimentally were done by the multimodal different biometric technologies in [1],[2]. An asynchronous fusion model based on the sequential sampling theory and prototype authentication engine for online examination were performed by face biometric recognition and generate randomly different tests for the test takers with storing images of the user described in [3],[4].

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***** Correspondence Author
Ghanashyam Rout*, Asst. Professor In The School Of Engineering , Kiit University, Bhubaneswar, Odisha, India.
Jibendu Sekhar Roy, professor in the School of Engineering KIIT University, Bhubaneswar, Odisha, India.

In online examination security system based on continuous keystroke biometric authentication, two-layered approach to address the problem of online examination takers' analyzed in [5],[6]. Online quiz examination was better process than compared to traditional examination process concerning time consuming, preparing, responding, learning and publishing of the results during particular time period which reduced the paper, pencil and pen described in [7],[8]. The test knowledge, skills, resourceful, time-saving and efficient were conducted through the on line examination which influenced the curriculum and attitudes of the students described in [9],[10]. In online examination had determined different question sets automatically, interactively for each student and measured the competence of the students where in paper-based examination system had to wastage of resources, time consumption and series of errors pointed in [11]. The teachers efficiently organize examination materials and consequently lighten the load in checking students' answers to examination and also the security of the examination were described in [12],[13]. In online examination process, the evaluation and gradation of the student was totally automated for multiple choice questions described in [14],[15]. The reasonable level of security and integrity on the conduction of on line examination was totally depended on Web-based Departmental Activity Information System (DAIS) explained in [16],[17]. The traditional examination was lack of comfort than on line examination and created set of question from the question bank to conducting Academic and Non-Academic examinations for the student described in [18],[19]. The development of Multiple Choice Examination System through online and maintained security, impacts and associated challenges issues were examined in [20],[21].The process of conducting examinations, processing results, security and integrity were better than paper based of examination and reduced the time to publish the result very fast and accurate in [22],[23]. Articulating all researchers' past work about on line examination in organization that they had done quiz test, surprising test, subject wise quiz test etc. But they have not done chapter wise MCQs test in subject. In this paper we have to propose three modules MCQs test and last module paper based test. For which on line examination is better performance than traditional method. In traditional method students, results are not accurate since calculations are done manually. In online examination system after giving the examination mark will directly enter against of the students roll number and examination is totally automated system.

The purpose of online examination is a good online test, save the time for papers checking and also provides the results rapidly. Online Examination is required a computerized system to handle all the works required a web based application to provide a working environment.

II. OVERVIEW OF THE ON LINE EXAMINATION

Time is spurious for students and teachers during the study atmosphere in organization. In any organization, the conducting of examination smoothly is most vital job for everyone. In many organization, the conducting of examinations are different types as: half yearly, annually and semester wise. The examinations are conducting particular time duration in organization which is declared by the controller of examination / higher authorities of the organization. The conducting of examination, evaluation of examination copies and publications of result will take long time process. For which some students will face problem to join in higher education inside and outside the country and also for other purposes. During examination time if some kind of national calamity/tornado, political strike/students strike / public strike will happened outside/inside campus or health problem of the students, then the students cannot able to appear the examination in proper time. It is too difficult to get time re-conducting the examination further. So the students are facing a lot of problem to complete the examination process. To avoiding such type of problems, a better system is on line examination with dividing the subject into four modules. .In world any organization or universities have number of departments with number of courses. Each course has number of subjects and subjects have number of modulus / chapters. A subject has divided into four modulus such as 1, 2, 3 and 4 .Then from each modulus the expert of the organization or universities will prepare MCQ (Multiple Choice Questions) at least 200 MCQ in each modulus in proper manner. In this way each subject has contain more than 600 MCQ. The three modules MCQ are inserted in the department database system earlier and every modulo carry 25 marks each. In 4th modulo the authority of organization will prepare subjective questions for paper based examination. In subjective questions, 5 questions will solve by the students which common to all. These answer copies will scan and will sent to the respective teachers through their mail for evaluation purpose. The concern teacher will sent that result to the data base of the organization after evaluated the examination copies. The software is built in database system in such a way that for every candidate or student when appear the examinations 25 nos. of shuffling question will come with 25 marks of 25 nos. of questions. The answers of all MCQs are inserted in data base of the organizations earlier. When student will enter in the examination hall to appear the examination by that time they have to give biometric at the entrance of the examination hall. Then the student's picture and registration number will appear on the monitor of the computer in the examination hall and the respective students will go to their respective system and enter the roll number, password and subject code in the computer then desired MCQs questions will appear on the monitor with respective subject with fixed time. The time duration of the subject of the test will display on the monitor .Then the student or candidate will continue their examination test smoothly with stimulated time duration. In this process all the correct answer marks will enter in his /her respective of the roll numbers. When time period is over automatically the MCQ questions of the respective subjects will disappear on the monitor of the computer. Finally deserved mark of the candidate/student will store against their roll numbers. In this manner when the student or candidate will appear the three modulus MCQs test of the subject the marks will be stored against of the respective roll numbers. Ast the end of the course the organizations/universities will conduct subject test containing four modules with five questions, each question carry five marks after appearing the examination by the students or the candidates that paper will be scanned by the authority of the examination section. After scanning the answer sheets that will send to the respective teachers or professors by their e-mail with password .Then the teachers or the professors will start evaluation process then the marks of the student or the candidate will be entered in respective roll numbers. Deserved marks of the students earlier three modulus MCQs have 75 marks and subject wise test having 25 marks will add together with respective roll number finally. Then the student or the candidates will deserved desire marks out of 100 marks and that marks will communicate to the student's mobile In this way the candidate or student will deserve their marks with different subjects.

III. ALGORITHM FOR ONLINE EXAMINATION

In put portal: Insert the ID numbers and pass words of the student's on the database of the organization with respective department wise earlier.

In put portal: Organization has computer based an examination hall which will set up internet with database.

In put portal: Insert yearly /semester wise MCQs in different subjects on the data base of the organization earlier.

In put portal: The program is build in such a way that in every times 25 nos. of shuffled MCQs will generate when the candidate appearing the examination in the examination hall after allowing by the examination authority.

In put portal: In each module of the subject will conduct the on line examination after complete module of the subjects by the teacher. In put portal: Before appearing the examination, the examination authority will take photo and bio-metrics of the candidate with his/her roll no and registration number. In put portal: Then candidates photo and roll no. will appear on the monitor of the computer inside the examination hall. In put portal: When student will enter his ID no., pass word and subject code, then 25 nos. of MCQs will display on the monitor with fixed 25 minutes time duration of respective subject.

In put portal: After completion of time duration, automatic MCQs will disappear on the monitor of the computer and total correct answer marks will store against the candidates roll number of the result sheet.
In put portal: The desired marks of test will store against the respective roll no. of candidate.
In put portal: In this manner rest of all the test will be completed.
In put portal: Similarly rest of all module will conduct in above said process.
In put portal: Three modules answer will store against the respective candidates roll nos.
In put portal: Fourth module will be conducted with paper based.
In put portal: After complete ion the syllabus of the respective subject, 25 marks for 5 questions will be conducted in paper based.
In put portal: Then that answer copies will scanned by the authority and sent to the respective teachers e-mail.
In put portal: The teachers e-mail ID is attached with the database of the organizer.
In put portal: When the concern teacher will complete checking process, automatically mark will store with respective roll numbers.
Output portal: The candidates mobile number will attached with the data base earlier. When result will publish immediately, then it will communicate to the candidates mobile.

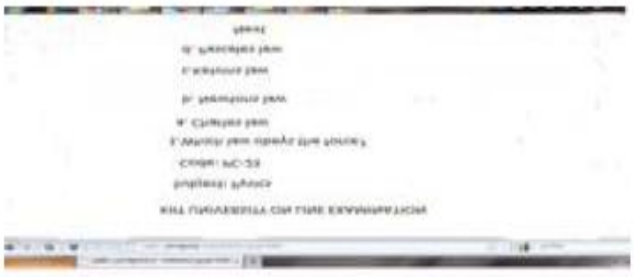
IV. METHODOLOGY FOR ON LINE EXAMINATION

Online examination is developed and effective complement than traditional examination due to Internet Technology. In traditional examination the problems are associated with examination venue capacity constraints, lack of comfort for examination candidates, delay in the release of results, examination malpractices, cost of printing examination materials and human faults etc. An online examination system allows an organization to conduct examination through the internet because it is quicker, easier and convenient to operate efficiently and getting better results in less time. The procedure for on line examination as described in below:
Step-1: Department-wise all students name, ID code number and pass word are on the data base system of the organization earlier.
Step-2: Insert nos. of MCQ module wise of the subjects on the data base of the organizer earlier.
Step-3: Before appearing the examination the candidate will give biometric in front of the examination hall. Then his / her roll number, registration number and photo will display on the screen of the computer in the examination hall.

Step-4: Then the candidate will go to the home page and enter his / her roll number, pass word and subject code.

Step-5: Next the 25 numbers of MCQs and time will display on the screen and the candidate will start the examination.

Step-6: When time will complete automatically MCQs will disappear and total mark secured by candidate will display and also that mark will store against the roll number.



Step-7: Then such marks as statistical information will be estimated by simulating statistical signal processing by using MAT Lab to get accurate information. From the statistical information the average on line examination marks, standard deviation, and signal to noise ratio (SNR), coefficient variance and typical error will be determined.

V. ON LINE EXAMINATION RESULTS

Table 1:Online examination marks in all subject:

S	Math					Phy					Chem					Bio					Eng				
R	M 1	M 2	M 3	M 4	T	M 1	M 2	M 3	M 4	T	M 1	M 2	M 3	M 4	T	M 1	M 2	M 3	M 4	T	M 1	M 2	M 3	M 4	T
M	25	25	25	25	100	25	25	25	25	100	25	25	25	25	100	25	25	25	25	100	25	25	25	25	100
1	25	24	23	22	94	24	24	24	22	94	24	23	24	22	93	24	22	24	21	91	24	22	21	22	89
2	23	22	24	23	92	23	24	22	23	92	23	24	23	22	92	24	23	24	24	95	24	23	24	24	95
3	23	24	21	20	88	24	23	21	19	87	22	22	20	21	85	23	24	21	20	88	24	22	21	22	89
4	17	18	18	17	70	19	18	19	18	74	19	18	18	16	71	18	17	19	17	71	17	18	16	15	66
5	22	20	22	21	85	24	23	24	20	91	24	22	20	21	87	24	21	20	20	85	24	20	21	22	87
6	22	23	21	20	86	23	20	21	20	84	20	22	24	21	87	21	20	24	20	85	20	21	24	22	87
7	23	24	23	21	91	22	19	22	20	83	24	23	21	20	88	23	19	20	19	81	20	20	21	22	83
8	24	23	22	21	90	24	21	20	20	85	23	21	20	21	85	25	23	24	20	92	24	22	20	22	88
9	20	24	22	22	88	24	22	20	24	90	24	23	21	20	88	24	22	20	21	87	24	22	21	23	90
10	23	24	21	22	90	22	24	21	21	88	24	22	22	20	88	23	24	22	20	89	21	21	20	21	83
11	22	20	24	22	88	22	21	23	22	88	21	24	23	20	88	24	21	23	20	88	24	23	22	20	89
12	22	24	22	23	92	20	21	19	24	84	23	22	22	20	87	22	24	20	21	87	23	21	24	19	87
13	20	22	21	20	83	24	23	22	23	92	20	23	24	21	88	24	22	20	20	86	22	22	21	20	85
14	24	21	22	22	89	23	20	21	22	86	22	23	22	21	88	23	24	19	18	84	23	21	22	20	86
15	24	21	20	21	86	24	23	21	21	89	24	23	21	22	90	24	23	22	23	92	21	22	23	20	86
16	24	21	21	24	90	22	21	23	20	86	24	22	21	22	89	21	21	24	21	87	24	24	23	24	95
17	22	20	23	22	87	23	22	20	24	89	24	19	23	18	84	25	24	22	20	91	23	21	24	20	88
18	24	24	24	24	96	24	21	24	23	92	24	23	24	22	93	24	24	24	23	95	24	23	25	23	95
19	22	24	23	20	89	20	22	23	22	87	24	21	20	21	86	21	23	21	22	87	24	21	24	22	91
20	24	21	20	23	88	23	22	23	24	92	24	22	21	20	87	24	18	20	18	80	24	23	24	21	92
21	24	23	22	20	89	23	22	23	20	88	24	23	22	23	92	24	24	23	22	93	24	21	24	19	88
22	23	22	20	22	87	24	20	21	20	85	24	20	21	19	84	24	23	22	21	90	21	22	19	19	81
23	21	19	20	21	81	23	22	19	21	85	24	22	18	20	84	25	24	21	22	90	22	19	21	19	81
24	22	23	23	21	89	23	23	22	19	87	21	20	22	18	81	24	23	24	21	92	24	23	23	21	91
25	22	24	21	18	85	22	24	22	20	88	24	21	23	21	89	25	24	22	21	90	24	22	22	20	88
26	23	21	22	19	85	22	22	24	20	88	22	24	24	20	90	24	21	21	20	86	23	24	21	20	88

Table.2: Total marks in all subjects

Roll Nos.	Mathematics	Physics	Chemistry	Biology	English	Total
1	94	94	93	91	89	461
2	92	92	92	95	95	466
3	88	87	85	88	89	437
4	70	74	71	71	66	352
5	85	91	87	85	87	435
6	86	84	87	85	87	429
7	91	83	88	81	83	426
8	90	85	85	92	88	440
9	88	90	88	87	90	443
10	90	88	88	89	83	443
11	88	88	88	88	89	441
12	92	84	87	87	87	437
13	83	92	88	86	85	434
14	89	86	88	84	86	433
15	86	89	90	92	86	443
16	90	86	89	87	95	447
17	87	89	84	91	88	439
18	96	92	93	95	95	471
19	89	87	86	87	91	440
20	88	92	87	80	92	439
21	89	88	92	93	88	450
22	87	85	84	90	81	427
23	81	85	84	90	81	461
24	89	87	81	92	91	466
25	85	88	89	90	88	437
26	85	88	90	86	88	352
27	93	88	87	94	89	435
28	94	90	91	87	85	429
29	74	90	85	88	84	426
30	87	83	84	89	93	440

VI. ESTIMATION OF ONLINE EXAMINATION USING STATISTICAL SIGNAL PROCESSING

Wide statistical values representation (e.g. time-frequency or time-scale) are required for many engineering applications [24] in organization to help the better on line examination in organizations. Statistical data [25] were sensitive to deviations of the data from the ideal model as measurement of noise, temporary deviation from stationary (change in amplitude etc) & outliers. Depending on specify application, the algorithm have to adaptive to changing values and noise environments. In on line examination the average marks will determine by the help of mean of the total marks secured by the candidate in all subjects. The mean is designated as "μ" in statistics for the average value of the total subject's marks value. Y (n) is the marks in different subjects and N is the number of subjects, then mean is calculated as:

$$\mu = \frac{1}{N}\sum_{n=0}^{N-1} Y(n) \qquad (1)$$

Deviation of mean value is described by standard deviation(σ). The average standard deviation of marks is determined by summing the deviations of all the individual marks and divided by the total number of subjects N. The random noise [26] combine in an electric circuit & the resultant noise is equal to the combined power of individual signals. The standard deviation is the average deviation with its power, but not in amplitude, which is done by taking the squaring each of the deviation before taking the average. Then standard deviation (σ) is represented as:

$$\sigma = \sqrt{[\frac{1}{N}\sum_{n=0}^{N-1} \{Y(n) - \mu\}\hat{}\ 2]} \qquad (2)$$

Mean is measured while the standard deviation represented noise and other interference. Stochastic process [27],[28] of homogeneous trees aimed to process the multiscale statistical value & gave value level of resolution in terms of signal to noise ratio (SNR) which is

$$SNR(\rho) = (\mu/\sigma) \qquad (3)$$

Then coefficient of variance $CV(\vartheta)$ is defined as:

$$CV(\vartheta) = 100(\sigma/\mu) \qquad (4)$$

The random value of typical error (Ɛ) [TE] between mean and the N number of subjects is given by

$$\mathcal{E} = \sigma/\sqrt{N} \qquad (5)$$

For online examination of 30 students, different subjects marks and total marks secured by the candidates are tabulated in Table 1 and Table 2.

Table 3 Estimated parameters for 30 students using statistical signal processing

Roll Nos.	Total marks	Mean(μ) $\mu = \frac{1}{X}\sum_{n=0}^{X-1} Y(n)$	Std Deviation (σ) $\sigma = \sqrt{[\frac{1}{X}\sum_{n=0}^{X-1}(Y(n)-\mu)2]}$	SNR(ρ) $SNR(\rho) = (\mu/\sigma)$	$CV(\vartheta) = 100(\sigma/\mu)$	TE $\mathcal{E} = \sigma/\sqrt{X}$
1	461	92.2	1.9391	47.5485	2.1031	0.8672
2	466	93.2	1.4697	63.4146	1.5769	0.6573
3	437	87.4	1.3565	64.4321	1.552	0.6066
4	352	70.4	2.5768	27.3205	3.6603	1.1524
s5	435	87	2.1909	39.7099	2.5183	0.9798
6	429	85.8	1.1662	73.5729	1.3592	0.5215
7	426	85.2	3.7094	22.9684	4.3538	1.6589
8	440	88	2.7568	31.921	3.1327	1.2329
9	443	88.6	2.6153	33.8771	2.9519	1.1696
10	443	88.6	2.6153	33.8771	2.9519	1.1696
11	441	88.2	2.8568	31.931	3.2327	1.3329
12	437	87.4	2.5768	33.9178	2.9483	1.1524
13	434	86.8	3.0594	28.3715	3.5247	1.3682
14	433	86.6	1.7436	49.6685	2.0133	0.7797
15	443	88.6	2.3324	37.9869	2.6325	1.0431
16	447	89.4	3.1369	28.4997	3.5088	1.4029
17	439	87.8	2.3152	37.9238	2.6369	1.0354
18	471	94.2	1.4697	64.095	1.5602	0.6573
19	440	88	2.7568	31.921	3.1327	1.2329
20	439	87.8	2.6568	31.721	3.0327	1.0329
21	450	90	2.0976	42.9058	2.3307	0.9381
22	427	85.4	3.0067	28.4036	3.5207	1.3446
23	461	84.2	3.3106	25.4335	3.9318	1.4805
24	466	88	3.8987	22.5715	4.4304	1.7436
25	437	87.4	1.7776	49.1663	2.0339	0.795
26	352	88	1.8439	47.7247	2.0954	0.8246
27	435	90.2	2.7857	32.3799	3.0883	1.2458
28	429	89.4	3.1369	28.4997	3.5088	1.4029
29	426	84.2	5.5281	15.2312	6.5655	2.4722
30	440	88	2.7568	31.921	3.1327	1.2329

Typical error in the above table varies from about 11% to about 12.5%. This typical error is high in this case because error is calculated based on mean of the signal in this paper. Beyond the mean the signal noise is present over the span of standard deviation. Subject-wise teacher-wise SNRs calculated from the algorithm are much higher than the coefficient variance and also from the typical error. These estimation parameters are tabulated in Table 3. In this table SNR is of the order of 5 in all the cases. If number of data is large SNR is also large.

Table 4 Estimation parameters for on line examination results

Roll Nos	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SNR / CV	22.6086	40.2141	41.515	7.4641	15.7688	54.1297	5.2755	10.1895	54.5136	11.4765	486.2075	11.5042	8.0494	24.6696	14.4301
SNR / TE	54.831	96.482	106.213	23.708	40.529	14.107	13.845	25.891	13.758	28.964	123.263	29.433	20.736	63.699	36.418

Roll Nos.	16	17	18	19	20	21	22s	23	24	25	26	27	28	29	30
SNR / CV	8.1223	14.3822	41.0817	24.2	3.9818	18.4091	8.0677	6.4686	5.0947	24.1733	22.7765	10.4846	8.1223	2.3199	5.8672
SNR / TE	20.315	36.628	97.517	61.492	10.141	45.738	21.124	17.179	12.948	61.846	57.875	25.991	20.315	6.161	15.045

In this table, SNR/CV is less than SNR/TE, that is, it shows that noise of CV is more than noise of TE. Therefore, the online examination results estimation using the proposed statistical data based signal processing is very effective for evaluation in an organization.

VII. CONCLUSION AND FUTURE SCOPE

The MCQs test is done by on line examination allows to cover a large number of subjects from the entire course in organization in any time. In this system time is consuming less, comfort to appearing the examination, result is very precise and accurate, calculations and evaluations are done by the simulator itself, very secure as no chances of leakage of question paper and cost of price is less than traditional examination. Further the statistical signal processing is performed by the MAT LAB to determine the average value, standard deviation, SNR, CV and TE. After all we determine the SNR/CV and SNR/TE and found that SNR/TE result is better than the SNR/CV.

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AUTHORS PROFILE

Ghanashyam Rout Is A Asst. Professor In The School Of Engineering , KIIT University, Bhubaneswar, Odisha, India. I was passed B. Tech & M. Tech from University College of Engineering, Burla. Earlier I was serviced in Orissa Engineering College, Bhubaneswar and EAST college, Bhubaneswar. My area is Digital Signal Processing.

Jibendu Sekhar Roy is a professor in the School of Engineering KIIT University, Bhubaneswar, Odisha, India. Earlier he was a professor in ECE department, BIT, Mesra, Ranchi, India. He received his PhD from ETCE department, Jadavpur University, Calcutta, India and was a post-doctoral research associate of CNRS (Gov. of France) in IRCOM, University of Limoges, France. His research interests include antenna engineering, wave propagation through optical guiding structures, mobile communication, and signal processing. He has published approximately 250 papers in international journals and conferences. He serves as a reviewer for many international journals. He has visited France, USA, Italy, Indonesia, Denmark, Czech Republic, South Korea, Russia for paper presentations, invited talks, and as a session chair. He is a senior associate of ICTP, Trieste, Italy and member of many other technical societies.s