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> SIMULATION OF ACOUSTIC ECHOES <

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Abstract—This document details the simulation and analysis of acoustic echoes using MATLAB tools.

Index Terms—Acoustic echoes, MATLAB, reverberation, signal processing.

I. INTRODUCTION

The main objective of this project is to simulate and analyze acoustic reverberation phenomena, with an emphasis on their practical applications in digital signal processing.

II. PROCEDURE FOR SIMULATIONS

1 PE RE GARCÉ S, DAVID PET IT BÓ I VICT OR NAVARRO 1 P er e Ga r cés, Da vi d P et it bó i Vict or Na var r o - Th e m ain obje ct i ve of t hi s l a b sessi on i s t o sim ul at e an d ch ara ct eri z esever a l a coust i ce ffect susi n gMAT LABan dsom e ba si c t ool s of di gi t al si gna l pr ocessi n g. Mor e con cr et el y, t h e obj ect i ve i s t o sim ula t e th e a coust i c r ever ber at i on (i . e. , th e ech oes) i n a r oom . si gn a l. r ever ber a ti on in ar oom . l t o An al ogi ca l ): pr oduce th e ana l ogi cal signa l fr om an input digi ta l si gna l. Th e par t s of ech o gen er at i on an d ech oes can cel l a ti on wi l l be di vi ded int o: sim pl e ech o (just on e ech o) an d m ul ti pl e ech oes (m or eth an on e ech o). T o fi ni sh , th e i dea i s t o play t h e voi ce si gna l a ft er i t ha s been pr ocessed by a l l th e pr ogr am m ed syst em s. - 1. Anal ogi cal to di gi tal In thi s fir st sect i on , our fun cti on m ust con ver t a si gnal fr om an al ogi ca l t o di gi ta l, th i s si gna l wi l l be cr ea t ed by us usin g our m i cr oph on e. T o do th i s, we bui l t t wo di ffer en t fun cti on s, on eth at wi ll r ecor d our voi ce a n dan ot h er on eth at wi l l tran sla t e an d pl a y th e voi c e. 1 2. Si mpl e Ec ho In thi s sect i on, wen eeded t o cr ea t ea fun ct i on tha t wi l l cr eate ech oes th e syst em . Th i s si m pl e fun cti on wi l l be used t o cr ea t ea si m pl e ech o, s th edel a y th at we wi l l in ser t.

[Image]

[Insert Equation]

2 PE RE GARCÉ S, DAVID PET IT BÓ I VICT OR NAVARRO gen era t ed by t h e fun ct i on. 3. M ul ti pl e Ec hoe s In thi s sect i on, we wa n t ed t o gen era t em or e ech oes. Th i s si m pl e equat i on a ll owed us t o do i t, wh er ex(n ) i s our th e syst em . ech oes. 4. Si mpl e Ec ho Equal i ze r In thi s sect i on, wen eed t o cr eat e a fun cti on tha t al l ows us t o r em ove a l l th e ech o gen er at ed befor e (Si mpl e Ec ho). Th i s equa ti on wi l l r em ove a l l th e sim pl e ech o, wh er e y(n ) i s .i m pl em ent ed. 5. M ul ti pl e Ec hoe s Equal iz er In thi sl a st sect i on, we n eeded t o cr ea t ea fun ct i on that r em oved a l l th e ech oes gen era t edin sect i on M ul ti pl e Ec hoe s. Th i s equa ti on wi l l r em ove a l l of th em , wh er e y(n ) i s our voi c e, - Som e of t h e m i sta kes that we ha d wer e dur in gth e cr eat i on of th e di ffer en t fun cti on s, a s we wer e cr eat in gn ew voi ces a n d n ot usin g th e on es ma de befor e.

[Image]

[Insert Equation]

3 PE RE GARCÉ S, DAVID PET IT BÓ I VICT OR NAVARRO Al so we coul d ha ve cr ea t ed bet t ern oi ses wi t h using di ffer en t wor d so i t wi l l be ea si er t o di ffer en ti at e bet ween th e ori ginal an dth e ech o. - We used th ese uni t s in or der t o ma ke th e va ri a bl es: - t in secon ds - fs i n Hz - N (del a y) in secon ds - l earn edh ow t o gen er a t e voi c es a ndr epr esen t th em using th e Ma t la b t ool . Al so, i t wa s im port ant t o kn ow h ow t o cr ea t e ech oes a n dr em ove t h em a ft er. We t hin k tha t pra ct i cin g wi th th i s t ype of t ool s i s im port ant in or der t o do th el earnin g by doi n ga bout th i s subje ct . - 1: Vi deo expl i ca ti u Prà ct i ca 1 ht t ps:/ / dri ve. googl e. c om / fi l e/ d/ 1HNU1E M-UK wh V4DQgn sdZWz yr \_FZp3fWn / vi e w 2: Intr oduct i on t o Mat la b ht t ps:/ /a t en ea .upc. edu/ pl ugin fi l e. ph p/ 3123187/m od\_r e sour ce/ c on t en t/ 3/ Ba ckgr oun d\_St udy\_In tr oduct i on \_t o\_ MAT LAB. pdf

[Image]

[Insert Equation]

III. RESULTS

The simulation outcomes validate the implementation of reverberation and echo cancellation techniques.

IV. CONCLUSION

This study highlights the importance of digital tools, such as MATLAB, in processing and simulating acoustic signals.

REFERENCES

[1] MATLAB Documentation. Available: https://www.mathworks.com/