

Pseudo-Piano Tech

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1. Prologue

Roberto loves to play the piano. But he is not really a good pianist. In fact, he was able to play only a few pieces, including one well-known classical and one not-so-well-known Argentinian Tango pieces. However, his passion is not limited to playing. He also enjoys working on the piano. Maybe, this is from his engineering background. And this is a story of Roberto as an amateur piano technician. Since this is partially based on a true story, a lot of information here corresponds to real names and real procedures. There even will be some photographs. However, none of Roberto, I (the narrator), nor the author is responsible for any potentially negative consequences from using the information presented in this story.

By the way, my name is Lester. I was born in 1946 and am four feet and ten inches long. I have known Roberto only for about a year. However, due to unusually strong connection between us, I learned his story pretty well. That is, about his experience with pianos in various ways. How did I learn it? That is a topic of another story. Anyway, it all began in the summer of 2014.

At the age of fifty-four, Roberto started to practice the piano on an old Yamaha electronic keyboard. It has only 61 keys and the keyboard action is based on cheap springs. So, it was not at all a good instrument for practicing. However, he already had that keyboard and didn't want to spend any additional penny to get started. He also made a sustain pedal out of cardboard paper, aluminum foil, and a few pieces of electrical wire. It worked just fine.

About half a year later (the spring of 2015), Roberto was making a progress. In fact, he was hooked. In the summer of 2015, his family visited their relatives in Japan, where there is an old Kawai upright piano built in 1967. It had not been tuned for over thirty years. So, it was obviously out of tune even to the ears of Roberto. However, when he played it, it didn't matter too much to him. He was simply glad that he was able to use a full-size keyboard with 88 keys for the first time and was very impressed by the sound of an acoustic piano. At that point, he had no idea about what he was going through in the coming three years.

2. Digital Pianos

Yamaha P45

After coming home, Roberto couldn't forget the experience with a full-size keyboard. Considering his own skills and all the daunting issues associated with acoustic pianos, he decided to get a digital piano. He found an inexpensive used Yamaha portable digital piano P95 on the Guitar Center's web site. He ordered it and waited impatiently for the delivery. When he tried the piano, he quickly found a problem with one key. Regardless of the touch, that one key produced a loud sound at the maximum level. So, he returned the piano to the nearest Guitar Center on the same day. Since his patience was running out, he bought a new digital piano then and there. It was a Yamaha portable digital piano P45, the least expensive Yamaha digital piano with 88 keys. Roberto loved the piano and practiced every day.

Then, a year later, in the summer of 2016, Roberto's family visited the same relatives in Japan. Again, he was able to play the old Kawai upright. Even though he had been practicing on his digital piano for almost one year, it was at first difficult to get used to the touch of an acoustic piano. This time, the sound of an acoustic piano was even more appealing.

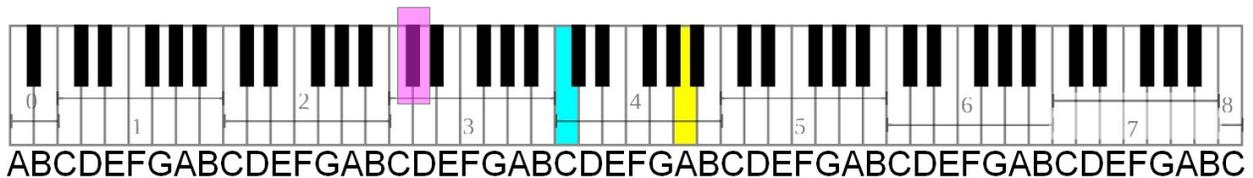
Back home, Roberto realized two issues with the Yamaha P45. First, the heaviness of key touch was quite different on the front and the back of each key. It was much heavier on the back. This was especially true for black keys. Since one of the music pieces Roberto was practicing involved a lot of black keys, this was affecting his practice. In addition, the keys didn't respond well when Roberto tried to play softly. Furthermore, the sound of the higher two octaves are rather weak and short. It is true that all the pianos have this characteristic. However, Roberto felt that he could not produce certain sounds as with the Kawai upright. He also wanted to use soft pedal but it was not supported by the P45.

Kawai ES100

This triggered Roberto to search for an alternative. Still, he was only thinking about digital pianos. Roberto spent a lot of time searching on-line and trying demo units at several music stores. Initially, he was interested in more expensive Yamaha models, both portable and console types. Most of the more expensive models have better key actions. They didn't have

the same key touch problem as the P45. They also have better sound engines. The higher two octaves sustain longer. However, they were all a lot more expensive than the P45. Then, Roberto noticed the Kawai portable digital piano ES100. It was more expensive than the P45 but substantially less so than the Yamaha models he was interested in. On-line reviews of the ES100 were invariably good, especially regarding the key touch and the sound, the two area he was focusing on. One problem with Kawai digital pianos was that demo units were not available in the local stores.

Eventually, through Kawai's web site, Roberto found one dealer about one-hour-drive away. He visited the store and tried the ES100, also in comparison to various other digital and acoustic pianos displayed there. He liked the ES100 but also had a concern. He thought that the sound around D₃ (marked in pink in the image below) was sort of "dull." But he was unable to pinpoint what exactly it was.



Roberto thought that it shouldn't be a big issue and brought one home. At home, he learned how to change the piano sound and realized that the sound of Concert Grand 2 (CG2) does not have the "dullness" around D₃ of the default piano sound (Concert Grand 1) as experienced in the store. So, he simply chose to use CG2 as his primary piano sound.

For a while, Roberto had a P45 and an ES100 side by side, a perfect opportunity to compare them in detail. The most striking difference was the key touch. On the ES100, the heaviness on the front and back of each key was much more even. On the ES100, it was also much easier to play softly. Also, the sound of the higher register was stronger and longer on the ES100. So, the two main issues with the P45, the key touch and the sound, were resolved.

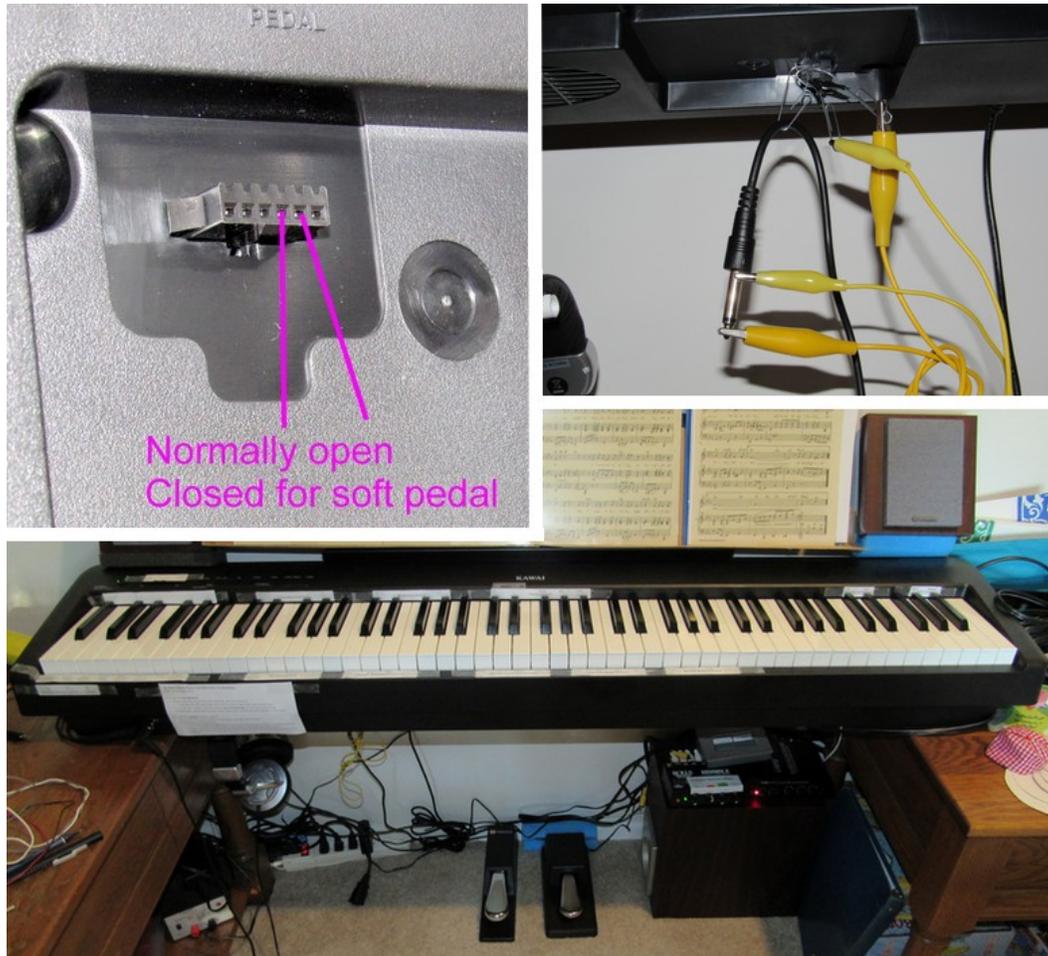
Another characteristic of the ES100 was that the sound quality naturally changes across the dynamic range. Soft sound was mellower and loud sound was brighter. The P45 didn't sound like that. After a few months, Roberto sold the P45.

Soft Pedal

The ES100 came with a very good half-pedaling damper pedal. In addition, the ES100 is capable of adding the triple pedal assembly. But this also requires an accompanying stand. Roberto had a cost-saving idea. He searched for a connector for the triple pedal. It was almost hidden under the cabinet. Then, he checked the electrical properties of the connector and realized that it can be used to attach a generic foot pedal as a soft pedal. Two

pins needed to be closed (see the image below).

But the connector is somewhat special. So, Roberto improvised a makeshift connector for an inexpensive piano-style foot pedal, using a few paper clips and alligator clip leads (again, see the image below). The addition of a soft pedal was an improvement.

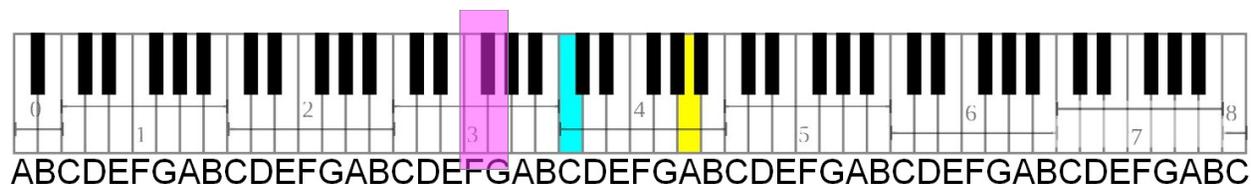


Using External Speakers

When he was reading ES100 reviews, he noticed that a lot of people recommended to use external speakers. Actually, Roberto too knew that there were inherent limitations with the internal speakers. They will never be able to produce the fundamental frequencies of, say, the lowest octave. Of course, since the piano bass sounds are full of harmonics, we still “hear” and recognize all the notes. So, he decided to use his existing audio system as external speakers. It consisted of a cheap amplifier with a separate subwoofer output (Lepy 2.1), Klipsch R-14M Bookshelf Speakers, and a passive subwoofer (which came with an old Pioneer mini audio system LifePlus NS-7). To share the audio system for both the ES100 and the music from a computer, Roberto purchased a powered stereo mixer (Rolls MX51S Mini

Mix II). This arrangement let him hear up to four sound sources at the same time at desired levels.

The first impression of the sound from the external audio system was good. It was clearer and rich, especially in the bass. Feeling good, Roberto also tried the ES100 default sound of Concert Grand (CG1). When Roberto played loud *with the damper pedal depressed*, he noticed a sort of “ballooning” effect around F3 through G3 (marked in pink in the image below). This happened only with CG1.



Even with CG1, this problem did not show up with the internal speakers or with headphones. So, Roberto suspected that his audio system had a problem. Using the sound samples available on <http://audiocheck.net>, he carefully checked the frequency response of the audio system. He was able to confirm that his audio system exaggerated the mid range including the F3-G3 area.

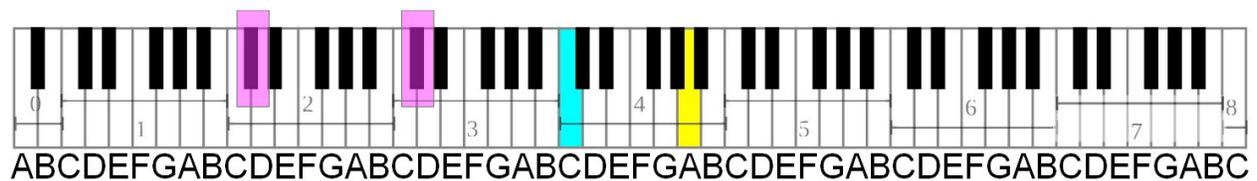
There were two factors contributing to this effect. First, the amplifier itself was bass-heavy (or lacking treble). Second, the subwoofer crossover setting of the amplifier was not working as advertised. That is, changing the crossover frequency did not cut the higher frequencies as expected. As a result, the already heavy mid range is fed to both the Klipsch speakers (which extends down to 64Hz) and the subwoofer (whose output can go beyond the F3-G3 area).

Eventually, Roberto got a used Yamaha powered subwoofer YST-SW215. With proper crossover setting on this subwoofer and reducing the bass level of the Lepy amplifier, he was able to eliminate the ballooning effect around the F3-G3 area. Finally, he was able to say that his external audio system does sound much better without any problem.

Although the F3-G3 ballooning was due to the poor frequency response of the external audio system, Roberto also realized that the default Concert Grand 1 (CG1) sound has the characteristic of rather strong sustenance around the F3-G3 area (that is, only with the damper pedal depressed). Now, according to the Kawai web site, the CG1 sound is “a well-rounded EX Concert Grand recorded in the standard fashion for classical and jazz music.” In contrast, the Concert Grand 2 (CG2) sound is “the original Harmonic Imaging Concert Grand sound.” Obviously, CG1 is Kawai’s flagship digitized sound. So, Roberto started to pay more attention to CG1. After comparing CG1 and CG2, he gradually became more attracted to CG1 than CG2. He thought that CG1 sounded richer.

Using Internal Speakers

After starting to use CG1 as his main sound, Roberto revisited the “dullness” around the D_b3, which he noticed in the store. What he realized was that this phenomenon occurs only when using the internal speakers. One way to reproduce this phenomenon consistently was to pound the D_b3 key repeatedly with the damper pedal depressed. This resulted in a “ballooning” effect similar to the one around the F3-G3 area. The same phenomenon occurs by pounding the D_b2 key as well (marked in pink in the image below).



Although the F3-G3 and D_b2/D_b3 “ballooning” sounded similar, these are separate issues. The F3-G3 “ballooning” happened only with the poor external audio system, not with the internal speakers or headphones. The D_b2/D_b3 “ballooning” happened only with the internal speakers, not with the external audio system or headphones. But both of these are specific to CG1. So, it must be associated with the strong sustenance of CG1. And this condition could be exaggerated in different ways.

As for D_b2/D_b3, Roberto’s hunch was as follows. These notes correspond to the frequencies of about 70Hz and 140Hz, respectively. Since this phenomenon is associated only with the internal speakers, Roberto suspected that the cabinet was functioning as a resonator at 140Hz. This frequency’s half wavelength (in the air) is about 50 inches, basically the same as the cabinet width. Roberto consulted Kawai America about this possibility. However, nobody from the Kawai company across the world, including engineers in the R&D section in Japan, was able to reproduce the phenomenon. So, they suspected that there is something wrong only with his unit. He was asked to bring his unit to the store for check up.

However, since he was no longer using the internal speakers, this was not really a big issue. Even with internal speakers, he could also use other piano sounds including CG2. Also around this time, something new was happening and this topic was fading out of his mind.

3. Acoustic Pianos

Gradually, but steadily, Roberto was being attracted by acoustic pianos. One of the factors was his experience with the old Kawai upright at his relatives' house. Also during the trip to Japan in the summer of 2016, he visited a friend, who has a Yamaha C1 grand piano. He also had an opportunity to visit the main Yamaha piano factory in Hamamatsu, Japan. There, he was able to play various concert grand pianos. These opportunities opened his interest in the key touch and the sound of grand pianos.

Since Roberto was still thinking that owning an acoustic piano would be a burden in many ways, he started to search for opportunities to “use” or “rent” an acoustic piano. There was a small music studio near his house. They rent rooms with pianos. Two pianos there were spinet and console-type verticals. Their sounds were terrible. The third one was Kawai upright. This one was quite old and not well-maintained. Pedals didn't work well and sounded a little funny on some keys.

Another possibility Roberto considered was to rent the local performing arts center, where there is a good quality Kawai grand piano. He goes there often and is familiar with the piano sound. Since he was a regular at the performing arts center, the manager of the center suggested that he could let Roberto use the space fairly freely (when available) with (presumably substantial) donation. Roberto was initially attracted by this idea but didn't proceed from there, being uncertain how exactly this could be worked out.

Then, while he was looking for a used saxophone for his son, he noticed a post on the Craigslist about a free grand piano. It seemed to be in a decent condition. He was intrigued by this post because almost all other “free” grand pianos advertised on the Craigslist appeared dysfunctional.

Roberto had all the reasons *for* digital piano when he bought the P45 and switched to the ES100. There are many advantages of digital pianos. As for acoustic pianos, Roberto still had reservations. He was well aware that even if the piano itself is free, it would cost to move it. He was also aware that it would cost to tune and maintain an acoustic piano regularly. In addition, a grand piano will take up a lot of space. He was thinking about all these.

But maybe, it wouldn't hurt if Roberto gets a free grand piano *in addition to* his digital piano. Although he didn't have any specific ideas, he started to hope that other factors, including the space, can be handled somehow. Roberto thought that this was a good opportunity to *experiment*. With just the moving cost, he can get a grand piano.

Lester

According to the piano's owner, there were eleven or so responses to the post. When Roberto was finally given the piano, he felt lucky. So, he got the Lester piano, serial number

161249, ca. 1946, walnut color. Yes, that's me. Of course, reflecting my age, I have a lot of stories to tell. But I will leave them for other occasions. This is a story about Roberto's passion. When I first met Roberto at the previous owner's house. I noticed a hint of disappointment in his face. He was not completely happy. As I learned later, he was a little disappointed about the sound and the key touch. Still, it was a free grand piano for him. So, he took me home. It was October 2016.

At that point, I wasn't sure what Roberto was going to do to me. I knew that I was dusty and out of tune, sounded harsh, and didn't respond very well to his key touch. But considering my age and probably the way I was treated earlier, such deficiencies shouldn't be surprising. On the other hand, how Roberto treated me was a little surprising. At the beginning, he had very little idea about acoustic pianos. Over the period of about one year, he learned so much. I can say that he truly devoted to me.

Cleaning

The first thing he did was cleaning. He first cleaned the cabinet, plate, pin blocks, soundboard, and all the areas that can be accessed from outside. He used a vacuum cleaner, micro-fiber cloth, paper towel, etc. He also purchased a roll of silicone tube and used it in conjunction with the vacuum cleaner to access hard-to-reach areas. He used bamboo sticks to move around cloth under the strings on the soundboard. I couldn't remember when I was cleaned so thoroughly the last time. It was like going to an *onsen* and soak myself in a bath tub. Of course, there are blemishes that cannot be removed. But what can I say? I finally looked as good as my age.

Then, Roberto removed the fallboard and removed the entire action. He needed to consult books and some web sites to find out how to do it. But once he got the idea, it was fairly straightforward. He thoroughly cleaned the inside as well. I had completely forgotten that I kept so many objects inside me, including dead stink bugs and a baby teething gel. After that, he vacuum the action.

Tuning

Next, he read online that almost 90% of the complaints about piano sound can be fixed by proper tuning. While visiting the web sites of several local piano technicians, he found a web page which describes how to tune the piano. This was a turning point for him. Although he wasn't really sure if he was able to do it, he wanted to try anyway. He ordered a reasonably good tuning lever and a mute kit. It costed about the same amount as one-time professional tuning. Frankly, I doubted that tuning just once even by a professional would stay for a long time. I have a natural tendency to adapt to the environment, mostly the humidity.

First, Roberto learned a simple tuning technique available on the Internet. This method uses an electronic tuner to tune the middle strings of the middle octave (C4-B4) and then, all the

remaining strings by ear. He thought that this procedure was doable.

When he first tried to tune, it took several hours. Some tuning pins were loose and some others were tight. Even turning an extremely small amount with the lever could miss the desired pitch. The result was not so good. As soon as he thought he was done with some notes, he noticed that they were not at all in tune. But considering my condition, I would say that Roberto did a good job as a beginner. The truth is that as soon as a few strings were tuned, the additional tension introduced by this action immediately affected other strings. Roberto kept tuning. It was a good practice for him and he got better and better. Probably after several months, he was able to gain reasonable tuning stability.

However, Roberto gradually noticed that some harmonies are not as beautiful as they could be. In addition, gradually, he started to doubt the accuracy of tuning looking at the electronic tuner. By this time, he felt that eliminating beats by ear is easier and more accurate than looking at the display.

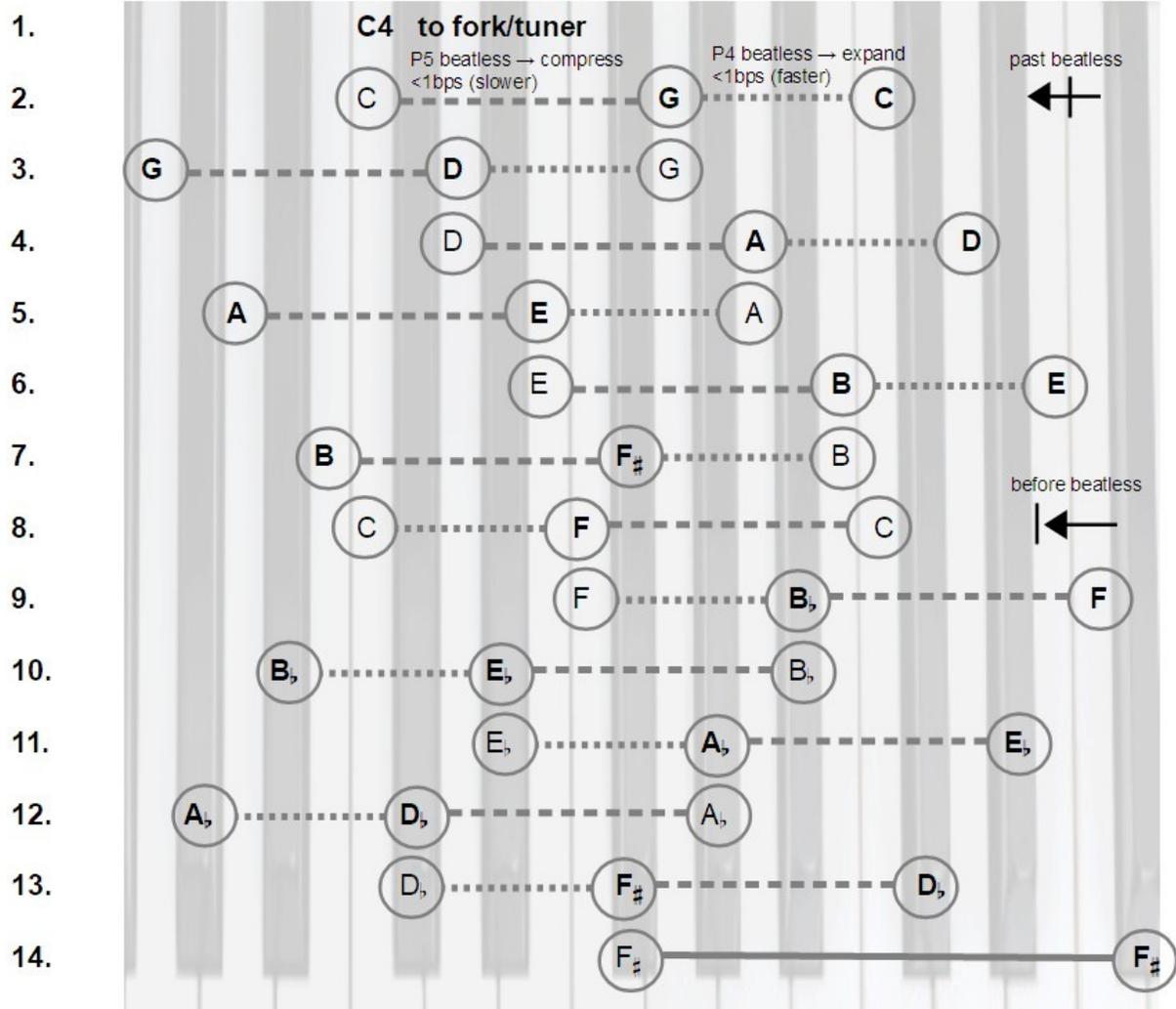
When Roberto was exploring new approaches to tuning, he got an extremely helpful book about piano maintenance called *Pianos Inside Out* by Mario Igréc. One simple tuning method in the book was as follows. First, tune the A4 to a tuning fork or an electronic tuner. Then, tune the middle strings of the range A3-A4 by ear, noticing subtle off-beat of the perfect fifth (distance for five whole notes) and perfect fourth (distance for four whole notes). He tried this and it seemed to work better. But it was a little tricky to tune the perfect fifth and the perfect fourth except when they are paired within an octave. So, he modified this procedure and came up with a revised one, which is described below.

The first part of his new procedure tunes most of the middle *two* octaves (G3-F5). All the side strings need to be muted. The majority of this section was muted with a felt mute strip. There are a few notes that cannot be covered this way, for example, across a part of the plate. They were individually muted with rubber mutes; in this case, the middle and the right strings of each note were muted with a single mute.

Now, here are the first several steps (for a summary, see the image below). The notes which are being tuned in a particular step are in bold face.

1. Tune **C4** to the fork or the tuner
2. Tune **C5** against C4 so that there are no beats; Tune G4 against C4 so that there are *almost* no beats; Fine-tune **G4** so that the C4-G4 beats are slower than the G4-C5 beats
3. Tune **G3** against G4 so there are no beats; Tune D4 so that there are *almost* no beats; Fine-tune **D4** so that the G3-D4 beats is slower than the D4-G5 beats
4. Tune **D5** against D4 so there are no beats; Tune A4 so that there are *almost* no beats; Fine-tune **A4** so that the D4-A4 beats is slower than the A4-D5 beats

As far as Roberto is concerned, this procedure was easier because each new note is tuned either as an octave or by balancing within an octave (involving the perfect fifth and the perfect fourth on both side).



The second part of this procedure tunes the side strings in the middle two octaves (G3-F5). This can be done with rubber mutes, after removing the mute strip. He muted the right string to tune the left and the middle strings. He muted the left string to tune the middle and the right strings.

The third part of this procedure tunes all the remaining strings. He now starts with the left string first by muting the middle and the right strings of each note with a single mute. So, for example, he tunes the left string of G5 against the left string of G4. Then, he tunes the middle string of G5 against the left string of G5, muting the right string. Finally, he tunes the right string of G5 against both the left and the middle strings of G5 after removing the mute.

The outcome was more satisfactory. Various cords sound better with this method.

One benefit of learning how to tune was that he was now able to tune the old Kawai upright in their relative's house. Since this piano had not been tuned for over thirty years, he needed to proceed in multiple steps. The first thing he did was comparable to "pitch raising." He tuned each string roughly. The increased tension of all the strings affected the pitch of each string substantially. He did the same multiple times until some tuning stability emerged. Finally, he fine-tuned all the strings. After the tuning, this old Kawai still sounded great.

There was one more problem with this old piano. Several felts had come off from the hammers of the highest two octaves. Since nobody wanted to spend too much money or effort on this piano any more, Roberto bought and placed some household felt (with double-sided tape on one side) on those hammers. These notes sounded a little funny, but it was still better than no felt.

Voicing

Roberto complained a lot about my voice. Since my body was aging, there was little I could do by myself. But Roberto wanted to make the best out of me and started to try what he could do. Again, he relied on Mario Igréc's book, where he found a way to reduce harshness. The first thing he did was to sand the hammer felts to smooth out the grooves developed over many years. Initially, he used whatever sand paper available in his house and sanded a few hammer felts. The notes from the sanded hammers sounded with less harshness, yet some more clarity.

So, he bought three different grades of sanding sponges, coarse (80), medium (220), and extra fine. He used the coarse sanding sponge to reshape the hammer felt so that only a slight string marks were left. Then, used the medium and extra fine sponges to smooth out the surface. These sanding sponges were a lot easier to use than just sanding paper. The improvement was immediately noticeable.

The next step was to "needle" the hammer felts to soften them. Since Robert was still unsure how effective this procedure would be, he first used a household sewing needle to try a few hammer felts. This indeed made the treated notes mellower. But it was impractical to use the household needle for the rest of the hammer felts. So, he ordered special piano voicing needles. This has an ergonomic handle and can accommodate up to four needles. He needled the shoulders of each hammer felt and then the under crown. After doing this for all the 88 keys, I sounded much mellower. After several months, Roberto did another session of needling. I sounded even mellower but probably slightly nasal. So, he stopped there.

Since then, Roberto referred to my sound as *sweet* and never again complained about it.

Action Regulation

So, Roberto's only remaining major complaint was the key touch. He could not easily produce soft sounds. Again, it was not what I wanted to do but a natural consequence of my aging.

One day, Roberto noticed that the blow distance (the initial distance between the hammer and the string) is about half an inch greater than the standard amount described in I Grec's book. Due to various factors, the blow distance may increase as pianos age. So, he tried to adjust the blow distance. He needed to turn the screws accessible once the fallboard is removed. However, the space is very limited. He first used small household pliers to turn a few screws and see how that would affect the touch. Once the blow distance is adjusted to the standard amount, he was able to produce soft sounds more easily.

However, the access to the screws is so hard that it took a lot of time to adjust just one screw. So, again, Roberto ordered a specialized capstan regulation tool for this purpose. This made the task a lot easier. He also made another type of adjustment, the letoff, the position where the hammer leaves the control of the key press. There were some inconsistency. While the action was removed, he lubricate the knuckles and balance pins. The combination of all these improved the key touch. He had more control.

Miscellaneous

There were several more points to mention. Roberto occasionally heard a few different types of buzzes. One time, it was from a tin can placed on a side table behind the piano. The tin can was removed. Another time, it was from the lid props. I have long and short props and these were making the buzz. So, he wrapped a piece of non-slip rubber mat around the main lid prop.

The pedals needed some adjustment. The una corda pedal was not moving sufficiently. This was adjusted by turning the rod under the piano. The damper pedal was not moving sufficiently either. However, when Roberto tried to turn the rod, it reached the maximum amount and didn't go any further. So, he inserted a few sheets of thick paper to that effect. This worked.

In addition, the dampers themselves were deteriorating. The wedged ones were losing their proper shapes. However, Roberto has done nothing. It was too much for him. He often said to me, "There is the limit to what I can do to you."

Kawai GS-30

Although I didn't really like it, I knew that Roberto was entertaining the idea of replacing me with a larger grand piano. He knew that a larger piano sounds better, in general. He was checking the Craigslist every day. On one day in September 2017, he noticed a 5'10" Baldwin grand piano at a really low price. It looked all right to him. Although the photo appeared to

be smaller than the advertised size, he thought that a grand piano can look much smaller or bigger depending on which direction the photo is taken from. So, he wasn't overly concerned. He made an appointment and visited the owner, about one-hour-drive away.

The piano was terrible. It was more like 4'8", even smaller than me. It was so outrageously out of tune that he didn't even try to play. There was no way such a piano could replace me.

Then, Roberto recalled that there was a piano store in that direction. This piano store is a dealer of one of the most expensive piano brands. As such, they specialize expensive pianos. But he once heard that this store has a large warehouse with a selection of used pianos. He always wanted to go there but didn't have a chance. So, on the way home, he stopped by there.

At first, the salesperson showed him some used pianos in the showroom. They looked like new and priced accordingly. Roberto asked to see less expensive used pianos. So, the salesperson took him to the huge back room, where there were several more used grand pianos. Those were trade-ins. In order to sell their expensive pianos, they take practically any piano for a nominal price. If the store judges that the piano has a good resale value with minimal work, they will clean, recondition, tune, and display in their show rooms. Others would stay in their back room practically abandoned. According to the salesperson, most of them would be sold to piano repair shops or consignment stores.

Among the pianos in the back room, there were two Kawai's. Roberto was particularly interested in used Kawai's. He became familiar with the Kawai brand from his Kawai digital piano and his relatives' Kawai upright. He is also familiar with the sound of the Kawai grand piano at a local performing arts center. Many postings on piano forums also affected his preference.

One of the two Kawai's there was about seven feet long, too big. The other was about six feet long, just the size Roberto was interested in. It was not completely but noticeably out of tune. So, he wasn't able to tell how it would sound when it is tuned. The action seemed very good. It was dusty. The model number was GS-30.

When Roberto was checking on various pianos there, an elderly couple came and bought an expensive new piano right away ... without playing it by themselves. When Roberto was playing part of the classical piece he was able to play, the lady came to him and asked to play the whole thing. Roberto was hesitant. He never really played the piano in front of others (except for his families). But when he wants to try pianos at a store, he cannot really escape. Quickly, he recalled that the salesperson was playing some modern piano pieces beautifully and told the lady that the salesperson could play the same piece. The salesperson was hesitant for a moment but then took them to the demo unit and played the piece. He sounded a little hesitant at first but then continued beautifully. After the couple left, Roberto thanked the salesperson for playing the piece and saving Roberto from doing so. The salesperson acknowledged and said that he had not played the piece for many years. Roberto was impressed. Then, the salesperson let Roberto play the demo unit and

encouraged him to come back. It was clear to the salesperson that Roberto really likes to play the piano and was looking for an affordable piano.

After coming home, Roberto checked the information about Kawai GS-30 on the Internet. It looked good. For several days, Roberto was thinking about that piano. Even this trade-in item would be a significant expense for Roberto. He wasn't sure if this is what he wanted. But eventually he decided to return to the store to make a decision to buy the piano. He was indeed mentally prepared to buy it, unless there is something wrong with the piano. At the store, he checked the piano again, thoroughly. But there was a limit to what he could do in a dark back room. Even with a flashlight, he may have missed various deficiencies. And of course, it was a risky business to buy a used piano not knowing how exactly it would sound after tuning. However, Roberto was somewhat confident that he could make it sound good. This was from his limited experience with me.

According to the serial number, 1344417, the Kawai GS-30 was made in 1982. That's about half my age. Finally, Roberto decided to buy it and sat down with the salesperson to negotiate the price. Then, the salesperson said that the piano has some cracks in the soundboard. Roberto was really shocked. He couldn't find them by himself. He couldn't hear anything wrong either. So, they went back to the piano. The salesperson showed two cracks in the soundboard. When Roberto played some notes, he still couldn't hear any buzzes or rattles from the cracks. The salesperson said that the piano has no resale value due to those cracks. So, the piano was destined to a consignment store. He asked Roberto if he still wanted the piano.

It was a challenge for Roberto. He thought that he became good at examining used pianos. Still, he had to realize the lack of expertise in him. What about if the piano is useless? After an agonizing internal debate, Roberto decided to buy the piano any way. He asked for the best the salesperson could do regarding the price. The salesperson called his supervisor and offered Roberto a favorable deal. He agreed to sell the piano basically at the trade-in price. That is, they were not making a profit out of this sale. The sale condition was: as is, no warranty, no service, not even delivery arrangement. Roberto asked for a bench and got one within the deal. The salesperson told Roberto that this was a very special case for an individual customer. The sale term was as if Roberto were a repair shop.

After the deal, they talked a little about their personal circumstances. The salesperson was forced to take piano lesson from the age five to fifteen. He hated it and quit. After one year of not playing, he was watching a high school talent show. There were some contestants who played the piano. But he thought none of them were as good as him. So, he jumped in and won the first prize. This changed his course. He became a pianist. However, it is an extremely competitive field. So, he was no longer performing as a pianist. He teaches the piano in the evening and works as a piano salesperson during the day.

At home, Roberto arranged a piano mover for the delivery about a week later. While waiting for the piano, his thought wandered a lot. It was a mixture of excitement, hope, uncertainty,

and regret. He was not so sure if he could handle the cracks. I was watching him nervously.

Delivery

When I saw the new piano, I was quite impressed. It was much larger, heavier, and younger than me. It was ebony polish and weighed whopping 700 lbs. And the mover was very helpful. While the piano was still standing sideways, they showed Roberto a location of cracks from under the piano. The soundboard and the rib were separated. Between the space, there was a piece of paper. The mover told him that this was a simple trick to eliminate the rattle from that space. Roberto was searching for how to repair soundboard cracks but didn't come across a trick like this.

The movers also pointed out the lyre was becoming detached from the lyre post. They suggested to place a phone book beneath the lyre but said that it could easily be glued.

They also told Roberto about how to clean the exterior using automotive cleaning agent ... something #9.

Cleaning

As the piano was practically abandoned, it required a lot of work to clean it. On the treble side, there were watermarks on the lid and the cabinet. Roberto wondered what had happened. But since it was on one side, he thought that it couldn't be from being left in rain. It was quite dusty inside the cabinet. The plate was not shining.

Roberto started to clean, just as he did to me. Since this was the second time, he was more effective, efficient, and methodical. As for the piano movers' suggestion about automotive cleaning agent, he didn't follow. He checked the I Grec's book and read that minor soap water can be used to clean the exterior. So, he just moistened a piece of cloth, wiped a small area at a time, and then dry wiped there. This was basically how he cleans his car exterior when there are dirty spots. This was probably not as efficient as using a specialized agent. But it worked and the exterior became as good as new.

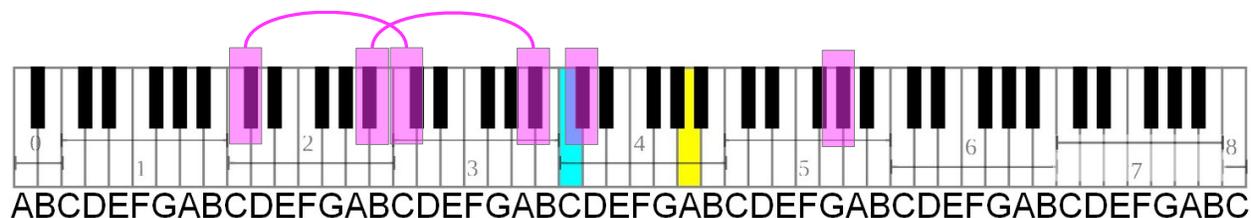
Roberto used a paint brush, a tooth brush, a piece of cloth with a chopstick, etc., and cleaned everywhere he had an easy access. Later, he removed the action and cleaned the inside and the action. He said the inside was much cleaner than me when I came here.

Comparing with me, Roberto referred to the GS-30, "almost like new."

Soundboard Cracks

After cleaning the soundboard, Roberto realized the extent of cracks. There were not just two but several cracks. Some of them were invisible because of dust. One of them were crossing the treble bridge.

As he started to test the piano more carefully, he did notice rattles/buzzes. There were at least four different areas of the keyboard that seemed to generate rattles (marked in pink in the image below).



The first rattle was from around the keys B₃ and B₄. He recalled what the piano mover said and focused on the crack reaching the left end of the soundboard. He went under the piano and took a closer look. The piece of paper which the mover pointed out was still there. He removed the paper and inserted a few sheets of paper in the space between the soundboard and the rib. He used multiple small, thin pieces of paper so that the space is filled just right but not too tight. It was a little difficult to deal with thin paper because it would bend easily. So, he started to use transparency film. He had a lot of them for over-head projector presentations. Of course, nobody uses it any more. Except that it is transparent and difficult to see, it worked out well. He was able to insert just the right number of films to fill the space. When he checked the sound, the rattle was gone.

The second time he heard the rattle, it was from around the key A₅. This time, he suspected the cracks in the middle part of the soundboard. So, he went under the piano and filled the space between the soundboard and the ribs at several locations. This eliminated the rattle.

The third time was from around the key D₄. This time, the buzz seemed to come from the action area. He patted various parts of cabinet around the action area. The rattle stopped.

The fourth one was from around the keys C₂/C₃. This time, the buzz came from the hinges of the lid. After tightening loose screws, it stopped.

So far, these are the only cases that Robert was able to tell. There may be more. But as long as he doesn't notice, it was all right. So, he was relieved at least for the moment. The cracks didn't immediately shutter his dream of playing this piano.

But he had no idea how these cracks might expand. He knew that they would never get better. They could only get worse. Although Roberto pays attention to the room humidity, he was still unsure about what could happen. So, he had started to think about contingency planning. If rattles return and become uncontrollable with inserting transparency films, he

will need to find a way to deal with them.

The basic idea to fix cracked soundboard is to re-attach the soundboard and the rib. One critical element in this work is that the soundboard of a grand piano is clearly visible when the lid is open. So, aesthetically speaking, the surface of the soundboard must be intact. One approach he read in the book and on the Internet was to glue the soundboard and the rib with the help of a temporary fastener. This can be devised by drilling a hole from under the soundboard through the rib, screw into the soundboard (but not piercing through), and tighten it.

However, for Roberto, the aesthetics was secondary. As long as the rattles can be controlled, he would settle with any realistically simple method. He might even screw the soundboard and the ribs *from above*.

Humidity

By this time, Roberto was well aware of the importance of controlling the indoor relative humidity within 40 to 50%. First of all, the soundboard cracks were caused by dryness. As the winter season approached, the indoor humidity was going down below 40%. Initially, he even considered to install a humidity control system specifically designed for piano, called Damp Chaser. While a large number of piano technicians recommend the system, there also was an on-line article discussing the limitation of a “localized” humidity control system. In addition, Roberto was not prepared to do the rather complex maintenance procedure involving Damp Chaser.

Luckily, Roberto’s house is equipped with a whole-house humidifier. Initially, he was monitoring the indoor humidity level with the whole-house humidifier’s control unit. After a while, he realized that the reading was different from his other hygrometers. Since the other two units agree more, he thought that the whole-house humidifier’s control unit was not accurate. After exploring the service manual (not the user manual) of the control unit, he found a way to calibrate the humidity reading. He adjusted the reading by 4%. This way, the humidifier kicks in at a more appropriate point. He was able to control the indoor humidity above 40% most of the time, even during the winter. When the outside temperature is extremely low, say, 10F, the humidity level tends to go as low as 38%. Then, he boiled water to increased the humidity level. This seemed to work as a temporary measure.

So far, there seems to be no obvious humidity issues.

Tuning Stability

As soon as Roberto finished the first phase of cleaning, he quickly tuned the piano. This way, he was able to play it. Then, he spent some more time cleaning without tuning. After detailed cleaning, he did the first thorough tuning. He also lubricated parts of the strings at

certain contact points. He thought it was a lot easier to tune the GS-30 than tuning me. Most pins had the right amount of grip, not too loose or not too tight. There were several pins that were a little tighter than others but still much better than mine. So, he thought that he did a good job tuning.

Then, the next day, Roberto noticed that the piano didn't hold tuning very well. He became concerned. He lubricated the strings again. Then, he thoroughly tuned the piano again. The following day, the piano was again out of tune. At this point, he recalled his experience with me. It was like that. Probably worse. It took some time before I was able to hold tuning. This was probably because I had not been tuned for several years, I was moved, and Roberto just started to learn tuning.

This time, he is better. But the piano could have been through an out-of-tune experience even longer than I experienced. So, Roberto patiently monitored the condition. After a week or so, the piano started to hold tuning. Roberto was able to tell that several notes were slightly off. But it was not really offensive. At this point, Roberto's concern about tuning stability disappeared.

Sound Quality

Even after fairly good tuning, Roberto's honest impression was that the GS-30 didn't sound as good as it should. He is somewhat familiar with the "Kawai sound" from hearing other instruments. His vague idea was that the piano's sound is at about 75% level of the optimum. One problem was harshness. Well, according to Roberto, not as bad as I sounded. And this is a reasonably good instrument ... well, except for the cracks. And he had the experience of eliminating harshness from me. So, he was still optimistic.

Now, Roberto basically repeated the procedure which he did to me. First, he sanded the hammer felts. There were grooves but not as bad as mine when I came here. So, he was able to sand them relatively easily. This improved the sound dramatically. Most of the harshness was gone and yet the sound became clearer with beautiful timbre. Roberto's estimate was 90% of the optimum. He was able to enjoy the sound.

Then, Roberto needled the shoulders and under crowns of the hammer felts. This improved the sound even further. He thought that the sound became mellower. His estimate was 95% of the optimum level. Although he didn't think that he was able to achieve the 100% level, he was quite happy about the outcome. When he was needling, he felt that some hammer felts could benefit more needling and that he might be able to improve even more some time later.

While doing this, Roberto used two reference sounds. Of course, one was me. Before getting the Kawai GS-30, he considered my sound as "sweet." He thought that the GS-30 was still brighter than me, especially when producing loud sound. Comparing to the improved GS-30, he now considered my sound a little "nasal." He even thought he might have over-needed me.

One characteristic of the GS-30 was that it has much greater dynamic range than me. And this dynamic range is associated with varying sound quality. That is, soft sound was mellower and loud sound was brighter. I can't do that as well. And this property is better represented by the CG1 sound of the Kawai digital piano ES100.

So, the ES100 with CG1 was another reference point. Yes, Roberto still has the ES100 and uses it when he needs to use headphones. The CG1 sound was sampled from the Kawai concert grand EX, much larger than the GS-30. As such, it is beautiful. So, while voicing the GS-30, he occasionally compared its sound against the ES100 (CG1). He was pleased that the GS-30 sound approached that of CG1. But he also felt that the CG1 through his audio system was slightly muffled. In addition, as an entry-level digital piano, the ES100 does not have advanced technology such as string resonance. He was now definitely hooked on the beautiful acoustic sound of the Kawai GS-30. Finally, he was glad that he got this piano and was able to make it sound beautiful by himself. He was relieved.

4. Epilogue

Roberto no longer needed me and made an arrangement to give me away through the Craigslist. When I had to leave, I was sad. I had no idea what kind of treatment I would receive at the new location. When I was turned sideways and all my legs were removed, I must have lost my consciousness. I don't remember anything after that.

When I regained my consciousness, I was neither in a moving truck nor at a new house. Everything was still very familiar. I was still at Roberto's house. I saw his Kawai ES100 right next to me. Then, I was even more surprised to realize that I was now much larger, heavier, and younger. I was the Kawai GS-30.



Not The End.

Appendix: Revisiting Digital Pianos

Now, Roberto plays me, that is, me as GS-30, as much as he can. But he also plays the ES100 when he has to use headphones. In addition, when he visits music/piano stores, he tries various acoustic and digital pianos. Through this experience, he gained some more insight into the properties of digital pianos. First, unless the digital piano is a top-of-the-line model from Yamaha or Kawai, it is definitely beneficial to use a decent external audio system with audio-quality speakers (and subwoofer too unless the speakers cover the full bass). He realized that the placement of the speakers is also relevant. It would be ideal if the speakers are placed slightly farther away from the digital piano, imitating the soundboard position of a grand piano.

Although the ES100 is pretty good with respect to key touch, there still are some shortcomings. First, there is no grand repetition action (possibly due to the lack of so-called triple sensors). While it is possible to repeatedly produce notes by hitting the key before it returns to the half-way depressed position on a grand piano, the ES100 doesn't allow this. In addition, the keys of the ES100 does not "return" as fast as those on a grand piano. Higher-end digital pianos with wooden keys are better in this respect.

So, if we have certain constraints and cannot own a grand piano and still want the touch and sound of a grand piano, we need to spend a substantial amount of money to get a high quality digital piano. As for Roberto, he is happy with the ES100 because he takes the full advantage of my beautiful sound and responsive touch.