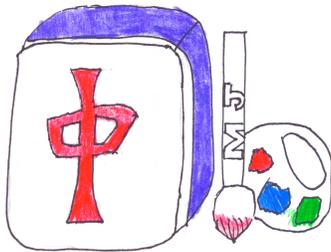


MJ

Z0*



Abstract

MJ is a four player, tile based game running on MacOS X® 10.6 and later. It features Chinese game play with classic scoring, an adapting computer player strategy, an intuitive interface with vector graphics for any screen size, and many customizable options.

Quick Start

The quickest route to play is simply clicking OK from the Setup window. However, entering your name would be a nice first step. Look in the General Preferences to preset your name as well as your opponents' names for future use.

*Pronounced as “zero.”

Dedication

Dedicated to my father who plays a remarkably strong and competitive game, without involving gambling, at an astonishing pace even in his sunset years.

Acknowledgments

Thanks to my parents and friends for their help with the Chinese translations. I am indebted to X_ƎTeX, X_ƎL^ATeX, and their developers [1] for enabling this manual's production with relative ease.

Preface

Among experienced players, the abbreviation mj is well known to mean the Chinese, four player tile game 麻雀 (Mah Jeuk, cantonese, original) or 麻將 (Mah Jeung, cantonese, modern; or Ma Jiang, mandarin), which has many English spelling variations due to transliteration practices (see Stanwick and Xu's article [6] for historical background). This manual uses mj for the generic game and MJ for the MacOS X application.

Although mj is a four player game, MJ provides configurable computer opponents for the lone player with an itch to play. As is common on computers, MJ is a single user program but distinguished from the category of solitaire games. The solitaire matching game, which uses mj tiles, is unfortunately often referred to as mahjong or some variant, and has raised some confusion. Also, while mj rule sets exist for three, five, or six players, they are quite different and will not be discussed in this manual.

Chinese words are sprinkled throughout this manual and within MJ by design; Section 6 has more information. Some words or phrases are translated with best effort, using Cantonese based transliterations; some are not because they would seem totally incongruent unless you understand the cultural or contextual meaning. The game of mj has so many cultural influences. My guiding principle is to use literal translations as much as possible, and provide some cultural context for those words without translation. Hopefully this manual gives enough of a flavor to help the reader appreciate the intricacies of mj.

Since mj's origin in the mid-1800's, its wide range of rules and strategies has evolved many variations across region (e.g., Japanese, American), time (e.g., Hong Kong Old, Hong Kong New), and players (recognized as house rules). While researching mj, I have come to appreciate Chinese game play with Classical scoring. Despite its name, it is not the original version of mj rules. However, the rules which evolved into Chinese-Classical became the most prevalent throughout China

and probably helped its proliferation around the world. MJ begins with Chinese-Classical, mainly due to my father, with plans for other rule sets.

All rule sets can be organized into two main parts — game play and scoring. Even though many rule sets exist, they all share many game play rules. The main differences are in scoring, with minor differences in game play. The common names of rule sets (e.g., Hong Kong Old, Hong Kong New), actually specify the scoring rules while implying the related game play rules. For example, the Hong Kong scoring systems operate under Chinese game play.

The Internet already has many places to find rule sets; *Mahjong Wiki* [2] is a start. However, I have yet to find a resource matching all of these criteria: 1) comprehensive; 2) detailed explanations; 3) easily available. Regarding (1), there are books, but as one enthusiast says, “every writer who writes mahjong rules writes them differently,” with which I must agree. Regarding (2), with the wide variety of game play rules plus house rules, my feeling is that most writers stick with the common principles for a wider audience but leave out some edge cases. Regarding (3), mj books are somewhat scarce in bookstores, at least where I have looked; and with Internet search, resources are lacking in one or both of the other points. My father, who has played for over 60 years, acknowledges the rule variations and simply notes that before you start a match, everyone should be familiar with the house rules. This manual assumes the reader has zero experience with mj.

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1 Introduction

The game of 麻雀 has a diverse, cultural heritage mirrored in its evolution from China to America and beyond. Throughout the production of MJ, I learned a few more items of Chinese culture including a piece my parents did not know. If you want a decent overview of mj, start with Wikipedia's *Mahjong* [9], then proceed with Sloper's *The MAH-JONGG FAQs* [4] to open pandora's box. One of MJ's design goals is to bridge a gap between older generation players (experienced with the Chinese rules but not the modern English translations) and younger generations (familiar with modern translations and rules but not the heritage and symbolism).

There are a handful of other mj computer applications, what makes MJ different?

- Among the major rule set varieties (such as Japanese, American, European, and so on), Chinese game play is fairly common and a baseline for all other rules. Besides game play, there may be several scoring rules variants (such as Hong Kong Old, Hong Kong New). Mahjong Wiki [2] gives a glimpse of several varieties. Even for a certain scoring rule set, there are style preferences or what can be called house rules. Within Chinese game play, Classical scoring is considered complicated because it has several more rules than other rule sets; hence, most mj applications offer simpler rule sets. MJ follows Classical scoring rules and adds the flexibility of house rules.
- Among the handful of mj applications I have seen and tried, in my biased opinion, their user interfaces are cumbersome. Most applications organize your tiles for you, in the developer's notion of tile order. If you had the tiles {1 2 2 3 3 4}, you might want to arrange them as {1 2 3 2 3 4}. In MJ, you may organize your tiles however you want or leave as is and play 看花張. Some applications require you to choose a game action after each player's discard, even when there is no possible action, but MJ prompts you only when necessary. Some applications, to save screen space, do not represent the four walls, but MJ efficiently represents all essential elements including the four walls within the smallest screen sizes.
- Scoring rules have perhaps the widest disparity among regions and individual players. Perhaps for this reason, many applications do not show how a hand is scored, and thus you are unable to verify or learn an application's scoring system. Furthermore, house rules add nuances to the complexities of scoring. MJ's flexibility means that scoring rules are easily changed. A scoring summary after each hand allows verification.
- Winning strategy is complex, changing as the game progresses with each discard. Designing a computer player is a hard task. The mj applications I have tried tend to use fairly predictable and simple strategies, which is not a critique but indicates the difficulty in strategies.

Based on my experience and analysis, I have developed an adapting computer player which I believe is stronger than any other personal computer program I am aware of. Systems like Suphx [5] are probably not in the personal category.

2 System Requirements

MJ is targeted to run on Mac OS X version 10.6 and later. The main playing window is designed to fit within even the smallest available displays. With scaling vector graphics, MJ maximizes the important visual elements while everything stays proportionally and perfectly aligned. If your screen is on the smaller side such as with portable computers, try hiding the Dock and maximizing the main window. Toggle the Dock's hidden status by pressing {Option-Command-D (⌘⌘D)}.

3 Terminology

In my continuing research on mj, I have encountered a wide mix of terminology, likely due to the many regional varieties and translation differences. Players have adapted to different terminology, yet uncertainty and awkwardness over proper terminology lingers especially among beginners. Attempts to unify or standardize the terminology [8, 10] seem to remain regional in their own jurisdictions. Therefore, in the interest of consistency, this manual's terminology is defined before getting into specific game play and scoring rules.

3.1 Dice (骰子)

Up to three, six-sided dice may be used, though one die, rolled three times, could also be used. Traditional mj dies have distinctive red markings for numbers one and four.

3.2 Cardinal Directions

The four cardinal directions have a few significant game play meanings (overloaded, in software programming terms), which are explained further when needed. Within mj, the directions are ordered explicitly as {east 東, south 南, west 西, north 北} and may be referred to by numbers 1–4. The directions are most often in the context of winds.

3.3 Turn Sequence

The regular turn sequence proceeds to the player on the right.

3.4 Seat Wind

Each player's seat or position is associated with a wind. Following turn sequence, the positions are {east, south, west, north}. The seat positions correspond to compass directions only if you are laying on the ground looking up. My guess to explain the rationale is rooted in Chinese cultural preference for clockwise and right hand priority. Players may be addressed by their relative seat wind positions.

3.5 Dealer (莊家)

The dealer's seat is always the east wind. Each player in turn sequence will eventually serve as dealer. When rolling dice for selecting random positions, the total number is counted off in turn sequence, starting with the dealer as number one.

3.6 Prevailing Wind (圈風)

A sequence of four players having served as dealer is labeled with what is known as the prevailing wind, which follows the sequence {east, south, west, north}.

3.7 Round (圈風)

Playing through a sequence of four prevailing winds comprises a round of game play.

3.8 Dealer Marker (圈風器)

The dealer marker serves two purposes. First, it identifies which player is the dealer — the marker must be kept within the dealer's vicinity. Second, it indicates the prevailing wind. Some mj game sets include a separate marker (起莊牌) identifying who was the initial dealer.

3.9 Match Length

A match's length depends on the rule set, style of play (for example, tournament), and the players. A natural unit is by rounds, though tournament matches may be timed. If a round can not be completed, finishing the prevailing wind is commonly accepted.

3.10 Tiles (牌)

Many mj variants start with 34 unique tile patterns: three dragons (中發白), four winds, three suits of nine ranks numbered 1–9 (一, 二, 三, 四, 五, 六, 七, 八, 九). The dragons and winds collectively may be called honors (番子). Among the suits, ranks 1 and 9 are called the ends (么九) while ranks 2–8 are the middles. Each of the 34 patterns has four identical tiles for a total of 136.

There are also two groups of four special tiles, collectively referred to as flowers (花), for a grand total of 144. One group is represented by four flowers, while the other group is represented by the four calendar seasons yet still referred to as flowers. The flowers are usually numbered for easy identification with the respective player positions (dealer is number one). Some rule sets omit the flowers or may incorporate other special tiles such as jokers or animals.

Dragons: red (紅中), green (發財), white (白板)

Winds: east (東), south (南), west (西), north (北)

Suits: characters (萬), bamboos (索), circles (銅)

Flowers: plum (梅), orchid (蘭), chrysanthemum (菊), bamboo (竹)

Seasons: spring (春), summer (夏), autumn (秋), winter (冬)

The English translations and names of tiles have evolved considerably. If you are familiar

with the Chinese words and wonder why some English translations are completely different, see [6] for more background information. MJ uses the English translations adopted by the Unicode Standard, which are known to be practically set in stone¹.

3.11 Hand

A hand refers to two distinct ideas and can be easily confused without any context. A hand may be a player's collection of tiles or an individual game. For example, a player may be said to have won three hands (individual games) in a row, or to have a hand (tiles) worth full points.

3.12 Melds

Melds are combinations of 2–4 tiles. The four types of melds are:

Eyes (眼) Two identical tiles.

Seuhng (上) Three tiles of the same suit in numerical sequence (such as {123}-bamboo). The sequence may not wrap around from 9 to 1.

Pung (碰) Three identical tiles.

Gong (槓) Four identical tiles.

¹The Unicode® Standard Character Code Chart for *Mahjong Tiles* [7] lists the tiles in the relevant orders prescribed by mj rules — except two flower tiles (chrysanthemum, bamboo) are reversed. I suggested a correction, but list order does not meet Unicode Consortium policy threshold for updating.

3.13 Sihk La (食啦)

The literal translation means to eat, but the game's meaning is to declare a winning hand. The scoring rules set will specify valid tile patterns for a winning hand.

3.14 Wall

Game preparation consists of each player shuffling and then building a wall of tiles, stacked two high and of equal length. The players' walls collectively form the Wall.

3.14.1 Floor

The general area enclosed within the Wall is considered the Floor. As the Wall's tiles are taken up for play, the Floor's area extends out.

3.14.2 Opening

Some rule sets may specify how the dealer uses the dice to determine where the Wall is opened (開牌), separating adjacent columns to create a gap, for dealing. There are a few common methods, but the principle is to pick a random location.

3.14.3 Head/Tail

From the Wall's open location, the column encountered in the clockwise direction is considered the Wall's head while the opposite direction is the tail.

3.14.4 Exhausted

A given rule set will specify the number of remaining tiles before the Wall is considered exhausted (摸空) and the hand ends in a tie. The remaining tiles may be known as the dead wall.

3.15 Opening Deal (開牌)

After the Wall has been opened, in turn sequence starting with the dealer, each player takes two columns of tiles (four total) from the Wall's head and continues according to the specific rule set.

3.16 Opening Replacement

Immediately following the Opening Deal, in turn sequence starting with the dealer, each player has an option to replace tiles as needed. Rule sets will specify the kinds of replacement.

3.17 Actions

The primary actions involve taking tiles, discarding tiles, and declaring melds.

3.17.1 Drawing Tiles (摸牌)

Tiles are drawn from the Wall's head.

3.17.2 Replacing Tiles (補牌)

When a player needs a replacement tile, a tile is drawn from the Wall's tail. Some rule sets use a separated section of tiles for replacements, also known as the dead wall.

3.17.3 Discarding Tiles (打牌)

A discarded tile is placed face up within the Floor.

3.17.4 Claiming Tiles

When a player discards a tile, the other players have an opportunity to claim it, subject to the following conditions.

1. The tile must be used to declare either sihk la or a meld.
2. If multiple players want the discard, claims are prioritized by the intended meld (from highest to lowest): sihk la, gong or pung, seuhng.
3. If multiple players declare sihk la, the next player in turn sequence from the discarding player has priority.
4. Claiming a tile for seuhng is valid only when the discard is from the preceding seat position (上家, the player on your left).
5. Claiming a tile for eyes is valid only when declaring sihk la.

3.17.5 Declaring Melds

When declaring a meld, the meld tiles are placed face up so as to be in plain view for all players. If declaring gong, which uses up four tiles, a replacement tile is needed.

For scoring purposes, melds are considered either exposed or concealed. When declaring a meld, it is normally considered exposed.

When declaring *sikh la*, the meld using the claimed tile is exposed; the remaining melds in hand are concealed. Concealed *pung* is indicated by stacking one tile on top of the other two.

3.18 Player Turn

A player's turn consists nominally of two required actions — taking and discarding a tile. If a tile was drawn from the Wall, then the player has an option of declaring either *sikh la*, *gong*, or a flower. When a replacement tile is needed, the player's turn restarts by drawing a replacement tile.

Required Draw a tile or claim the previous discard. If claiming the previous discard, the turn sequence is potentially preempted by skipping over any players between the discarding and claiming player.

Optional Declare either *sikh la*, *gong*, or a flower. Declaring *gong* is unique with two ways to form the meld. The player might have the four tiles in hand and open them altogether, or have an already declared *pung* and the fourth tile in hand, which can be used to promote the *pung* to *gong*. If declaring *gong* with four tiles in hand, then it is considered concealed. As most melds consist of three tiles, *gong* may be indicated by stacking one tile on top of the other three. If the *gong* is concealed, the stacked tile is placed face down.

Required Discard a tile to finish the turn.

4 Game Play

The various rule sets, such as Japanese or American, are distinguished by relatively minor differences in game play. Hence, within this section, only a rule set's differences or specific details from the common foundation of Section 3 will be covered.

4.1 Chinese

Playing *mj* is often associated with gambling, and in 1949, China's ban on gambling cooled public *mj* games but not the players' enthusiasm. However, recognizing *mj*'s undying, international popularity, China published in 1998 the first version of *Mahjong Competition Rules* [10], also known as Chinese Official Rules. The China sanctioned rules set is intended to steer the game away from a gambling style and towards a sporting style with rankings, similar to Chess. The rules described here are derived from the game play that Babcock simplified in 1920 for introduction to America.

4.1.1 Dice

Three dice are used, allowing for a range of sixteen possible values in 3–18. The odds for landing on a given player's position is either 24.5% or 25.5%, very close to 1/4.

4.1.2 Seating

Whenever starting a new round of play, players should be assigned seats randomly, using any convenient method. House rules may dictate when and how often seats are shuffled.

One method for seat assignment starts with all players taking any seat initially. Take one each of the four winds, placed face down, and shuffle them. A random player, acting as a pseudo-dealer, rolls the dice to determine who selects first. Chinese culture might allow the oldest player to roll. In turn sequence, each player selects a tile. The player selecting east gets to pick the desired seat or position around the table. All other players will occupy seats in sequence according to their selected tile.

4.1.3 Dealer Marker

Whenever starting a new round of play, a random player is selected, using any convenient method, to hold the dealer marker first. If the above method for selecting random seats is used, then the player who selected east may roll the dice to determine the initial dealer. The dice total could also be used to open the wall and begin the game, or the initial dealer could roll again.

4.1.4 Flowers (花)

Flowers are bonus tiles which are immediately exposed and require replacement tiles (補花). While flowers may be technically treated as ordinary tiles (that is, held in hand and declared as an optional action on any turn, similar to gong), they have no strategic benefits by keeping them in hand.

4.1.5 Sihk La (食啦)

A winning hand consists of exactly one meld of eyes and four of any other melds. If the

dealer wins, the player retains the dealer marker (臨莊). If a non-dealer wins, then the dealer marker passes to the next player in turn sequence from the dealer (過莊).

4.1.6 Wall Opening

The dealer rolls the dice to determine which player's wall to split. Then, using the dice total, count the wall's columns in clockwise fashion. The wall is opened after the dice total.

4.1.7 Opening Deal

A player's hand starts with thirteen (13) tiles. Therefore, players go through three cycles of taking two columns of tiles (four total) at a time. Each player then draws one more tile. Since the dealer also starts the first turn, the dealer, as a shortcut, customarily draws the thirteenth tile along with the first turn's tile at the same time. The two drawn tiles are not consecutive but look rather like a jump (跳牌) because they are exactly four tiles apart.

4.1.8 Opening Replacement

Opening replacement proceeds in two phases. First, players may replace any flowers, in turn sequence starting with the dealer. If any replacement tiles are also flowers, then players wait for their turn in sequence to replace them (後補). For example, suppose East has two flowers and South has one flower. East draws two replacements and happens to get another flower. East waits for South to

draw one replacement before East draws another replacement. Second, players may declare gong, in turn sequence starting with the dealer. If a player has multiple gong, they may be replaced at the same time.

4.1.9 Exhausted Wall

The Wall is exhausted when fourteen (14) tiles remain. The player drawing the last available tile has the sole, exclusive option of declaring *shik la*. Otherwise, the player does not discard a tile nor may draw a replacement tile, and the hand ends in a tie. If the dealer drew the last tile, the dealer retains the dealer marker (臨莊); otherwise, the dealer marker passes to the next player in turn sequence from the dealer (過莊).

The notion of dead wall has no practical meaning here and is generally disregarded. If you are experienced with other rule sets using a dead wall, you may consider it here as always replenishing but with no special purpose.

5 Scoring

All scoring systems assign a point value to a hand based on how its melds match with certain tile or overall hand patterns. Deriving the total value may involve points, faan (番), or both. Interestingly, faan has different uses and meanings depending on the scoring system, though it most often means a double. As a zero sum game, each player starts with some suitable number of points. House rules can scale point values as desired.

5.1 Chinese Classical (數糊尾)

Counting a hand's value involves three phases: 1) full, 2) additive, 3) doubling. Each phase consists of matching certain scoring factors to identify its points or doubles value. If a hand matches with certain patterns, then it qualifies for full points. Otherwise, proceed to the additive and doubling phases. For a quick reference listing of all Chinese Classical scoring factors, see Appendix C.

Additive Count the points from all sets, then add the bonus factors. Round up to the next multiple of ten.

Doubling Count the number of doubles (番) from all applicable scoring factors. The additive phase points are multiplied by two according to the number of doubles. The total is the hand's value.

The exponential nature of doubling factors can easily boost a hand's value very high. To guard against a player's score obliterating all others in a single hand, every hand's value is capped by a points limit. The full points value is usually taken as the points limit but could be lower. Before starting a live match, players should agree on the full points value and limit. Typical values are 500 or 1,000.

The winner collects the hand's value from all players. The player who discarded the winning tile (出沖) gives double the hand's value. If the winning tile was self-drawn, all players give double the hand's value. Note that the points limit applies only to a hand's value. Hence the maximum exchange is double the points limit.

Then the losing players exchange the difference between their hands' values. If the dealer is a loser, any exchanges with the dealer are doubled. Losing players have one restriction during the additive phase. Declaring any concealed sets for points may use only two or three tiles. That is, if a player has four identical tiles in hand, only three may be used for concealed pung.

Some game situations are considered risky play and may come with a penalty. For example, suppose player **A** has exposed melds which strongly hint towards a special hand. If **B** discards the winning tile which completes the special hand, then **B** would be considered 包 (the word is a shortened form of a phrase meaning the player constitutes everything as a gift) and must cover the points for all players! In order for this penalty to apply, **A** must give fair warning by announcing the possible 包 situation after enough melds are exposed, generally when the special hand pattern lacks one more meld. Such warning guards against players who might obscure their exposed melds or players discarding out of ignorance. Potential 包 situations are as follows.

If **A** has exposed nine tiles (three melds) towards one of these patterns:

- Pure Suited (清一式)
- Greens (綠一色)
- Honors (全番子)
- Ends (清么九)

then **A** should announce 九張包 is in effect. The meaning is that nine tiles are exposed for

the special hand. If **B** discards the winning tile which completes the special hand, then **B** is 包.

If **A** has 九張包 in effect and **B** discards a tile which **A** claims to complete another meld towards the special hand, then **A** should announce 十二張包自摸 is also in effect. The meaning is that twelve tiles are exposed for the special hand and **B** is also liable on a self-drawn win. The literal translation is twelve tiles but meaning that four melds are needed — three gong would not apply. As with 九張包, any player discarding the winning tile to complete the special hand is 包; but if **A** completes the special hand by self-draw (自摸), then **B** carries the burden of 包.

Suppose **A** has exposed melds towards:

- Three Dragons (三元)
- Four Winds (四喜)

but lacking one meld. Then **A** must announce the situation with either 包三元 or 包四喜 as appropriate. If **B** discards the tile which completes the special pattern (either lesser or greater) for a win, then **B** is 包. If **A** does not yet have a winning hand, then **A** has 包自摸 in effect—a win by self-draw means **B** is 包.

If the Wall is within five tiles before exhaustion, then every player must beware of 五子包生張 (meaning for the last five tiles, discarding a fresh tile for the win is 包). That is, if **B** discards a winning tile of which none have been exposed or discarded yet, then **B** is 包.

5.1.1 Full Points (滿糊)

Very rare tile patterns have the designation of 滿糊, automatically earning full points. Table 1 lists the full points tile patterns and whether they are in effect by default.

You may wonder why most of these patterns are not in effect by default. Players have different ideas of truly rare patterns, which are mostly the result of luck. Some patterns have been named and embellished with stories to describe their rarity [2]. Such stories take on legend status. Beware the player who tells a tale on the spot to describe their hand, trying to convince you of its full points value. Besides healthy skepticism of legends, players may readily acknowledge that some patterns have a large point value already via normal scoring which alleviates the need for special rules. Lastly, a pragmatic guide considers the rarity of these special patterns and pays little attention to them since they practically never occur. The moral here is that house rules vary widely in live play, so be certain you understand which rules are in effect.

- Greater 3 dragons (大三元) contains all three dragon pung. Note that winning is not required.
- Greater 4 winds (大四喜) contains all four wind pung. Note that winning is not required.
- A winning hand with seven flowers earns full points. *As an exception to the winning hand pattern, drawing the eighth flower qualifies as a winning hand.*

	greater 3 dragons (大三元)
	greater 4 winds (大四喜)
✓	win, 7 flowers
	win, gong on gong (槓上槓)
	win, 4 concealed pung
	win, 18 Arhats (十八羅漢)
	win, honors (全番子)
	win, greens (綠一色)
	win, ends (清么九)
✓	win on first tile
✓	win, 9 Gates (九子連環)
✓	win, 13 Orphans (十三么)
	win on flower, 5-circle
	win on stolen gong, 2-bamboo
	win on last tile, 1-circle
	win, 13 consecutive

Table 1: Full points tile patterns.

- Win on second gong (槓上槓) occurs if a player declares at least two gong on the same turn, winning on the replacement tile. Flowers may occur between the two gong, but the winning tile must be from gong replacement.
- Eighteen Arhats (十八羅漢)² refers to a hand containing 18 tiles or four gong.
- A winning hand with Honors contains only honor tiles.
- A winning hand with Greens (綠一色) refers to tiles colored with only green, according to traditional Chinese tile mark-

²Among Buddhist traditions, only Chinese tradition talks of these 18 Arhats. An arhat is considered to be either as close as possible to nirvana or just below buddha.

ings: green dragon, {2, 3, 4, 6, 8}-bamboo. The player may use only green tiles, building any set possible, to complete a winning hand.

- A winning hand with Ends contains only suits of rank 1 or 9.
- Win on first tile occurs if the dealer wins after opening replacement or if a non-dealer wins on the dealer's first discard.
- A hand of 9 Gates (九子連環) contains a single suit of {1 1 1 2 3 4 5 6 7 8 9 9 9} plus one more tile of any rank. In pure form, the player has the precise tiles listed here such that the winning tile may be any rank from the suit.
- A hand of 13 Orphans (十三么) contains one tile from each honor (7), each end (6), plus any matching tile to form the eyes. *This is an exception to the winning hand pattern.* Some references [2,3] mention an exception for this exception — a player may steal a declared, concealed gong to complete this hand.
- Win on flower, 5-circle occurs if the replacement tile is the winning tile and 5-circle.
- Win on stolen gong, 2-bamboo occurs when a player declares gong via pung promotion with 2-bamboo, but that tile becomes your winning tile.
- Win on last tile, 1-circle occurs if the last tile is the winning tile and 1-circle.

- Winning 13 consecutive hands is probably disregarded in practice because it is virtually impossible. A strict form of this rule does not allow for ties. An even stricter form requires the wins as dealer. MJ will simply keep track of wins.

5.1.2 Additive

Classic scoring awards points in many ways for building up a hand. Refer to Table 2 for point scoring factors and Table 3 for bonus point factors. A set may satisfy multiple factors for additional points. For example, a prevailing wind pair which is also your seat position is worth (2+2) points. Point modifiers are applied to the point scoring factors. Pung of end or honor tiles is worth two times (2x) as much as middle pung. Gong is worth four times (4x) as much as pung. A concealed meld is worth two times (2x) as much as an exposed meld.

The winning tile can incur multiple point scoring factors. Therefore, in live play, the winning player should clearly identify it for others to see. In the case of win by self-draw, the player should not mix the winning tile among the concealed tiles but should first open it apart from the concealed tiles.

2	pair, dragon
2	pair, wind, seat prevailing
2	pung, middle & exposed
2	win on eyes
2	win on center seuhng (卡隆)
2	win on edge seuhng (偏章)

Table 2: Point scoring factors.

- Win on eyes refers to when the winning tile completes the set of eyes.
- Win on center seuhng (卡隆) occurs if you have tiles $\{X Z\}$ and the winning tile is Y , where $X < Y < Z$.
- Win on edge seuhng (偏章) occurs if you have tiles $\{1 2\}$ or $\{8 9\}$ and the winning tile is 3 or 7, respectively.

30	win
2	win by self-draw (自摸)
4	flower (花)
0	win, concealed
30	win, seuhng (平糊)

Table 3: Bonus point factors.

- A concealed win must have only concealed sets.
- A seuhng win (平糊) contains seuhng and must have zero points from point scoring factors. Although seuhng melds have many more completion possibilities, the bonus for this hand rewards the risk of building a hand worth zero points. A house rule may relax this requirement by exempting scoring factors due to the winning tile, that is, the points are silently discarded. For example, a win on center seuhng would normally earn points and disqualify this bonus unless the house rule is in effect.

5.1.3 Doubling

Double scoring factors are related to some point scoring factors or certain tile patterns.

Refer to Table 4 for factors related to point scoring factors and Table 5 for scoring factors by tile patterns. A meld may satisfy multiple factors for additional doubles. For example, a prevailing wind pung which is also your seat position is worth $(1+1)$ doubles, also known as 雙番風. In qualifying for double scoring factors, gong is equivalent to pung, although some scoring factors call explicitly for gong.

1	pung, dragon
1	pung, wind, seat prevailing
1	flower, seat (正花)
0	win, concealed by self-draw
1	win, pure seuhng (清平糊)

Table 4: Double scoring factors for related point factors.

- Having both seat flowers is also known as 孖花 (twin flowers) or 孖 X , where X is your seat number.
- A pure seuhng win (清平糊) occurs when a seuhng hand has no flowers.
- Lesser 3 dragons (小三元) is two dragon pung and a pair of the third.
- Lesser 4 winds (小四喜) is three wind pung and a pair of the fourth.
- A flower group contains the four flowers or seasons (一檯花).
- Win on flower occurs when the replacement tile is the winning tile.
- Win on gong (槓上花) occurs when the replacement tile is the winning tile.

1	lesser 3 dragons (小三元)
1	lesser 4 winds (小四喜)
1	flower group (一槓花)
0	win on flower
1	win on gong (槓上花)
1	win on stolen gong (搶槓)
1	win on last tile
0	win, 3 concealed pung
0	win, 3 gong
0	win, middles
0	win, ends and honors
1	win, initial hand
2	win, pung (對對碰)
2	win, mixed, 1 suit (混一式)
3	win, pure, 1 suit (清一式)

Table 5: Double scoring factors by tile patterns.

- Win on stolen gong (搶槓) occurs when a player declares gong via pung promotion, but that tile becomes your winning tile.
- A middles hand contains sets from suits of ranks 2–8 only.
- A ends and honors hand contains sets from honors and suits of rank 1 or 9 only.
- An initial hand win refers to a hand using precisely the tiles from the opening deal — tiles may not be changed. To qualify for this scoring rule in live play, a player must announce this rule is in effect by calling to win (叫牌). Other players should verify whether the calling player discards any of the initial tiles.

In strict terms, the shortcut described

in Section ?? complicates this situation in two ways. First, the dealer gets an advantage of discarding any tile on the first turn. Second, there is an infinitesimally small chance that the dealer gets an initial hand of 13 Orphans (十三么), and during Opening Replacement, steals a gong. Both situations are unimaginably rare, hence the shortcut has been accepted as valid. An optional house rule for fairness allows each player to declare this rule after their first discard, but other issues can worsen the situation. MJ, by default, does not use the shortcut and will verify the initial tiles.

- A mixed suit win (混一式) contains sets from a single suit and honors.
- A pure suit win (清一式) contains sets from only a single suit.

6 Playing MJ

MJ is designed to be easy to use with flexible features, yet recognizing that there is a fine line between usability and features and that easy to use is highly subjective. With that in mind, my target user is my father who has poor eyesight. Therefore, the visual elements are on the larger side (even this manual uses a larger font size). The graphics will scale proportionally to use all available space; resize the playing window to your heart’s content. Button labels are Chinese with English tool tips. The score summary uses some Chinese labels to associate with the English descriptions.

Localization is not as simple a solution as it seems, especially with scaled graphics. The visual layout design for localized text generally requires unreasonably more effort adjusting the spacing to appear simply not awful. Plus, that is only between English and other Latin based languages. East asian languages use fixed length word symbols. A layout design which accommodates both fixed and variable length words would be like embedding the X_YTEX engine into MJ—I am grateful enough having it for this manual.

Besides, MJ’s design really is only to connect some Chinese words with their English descriptions, not to have fully translated, localized versions of the game. My father is conversationally fluent in English, but he would be confused by any of the many efforts at translating mj rules and terms because some words are difficult to translate without cultural or contextual understanding. For example, compare the translations within these documents [2, 8, 10]. However, my father would instantly recognize the Chinese words, so a simple design idea was to be succinct and frugal with the Chinese.

6.1 Setup

The Setup screen appears at first start or when choosing Match > New from the menu. Players’ names are filled with presets for convenience, but you may use any names you like. Names may also be saved on the Preferences screen, to be used on subsequent starts. Each player has a Lefty option which sets how the tiles are positioned. A left-handed player, such as my father, would pick up tiles and

place them on the left side.

Since the two main actions are discarding and claiming, each computer player has options for discard and claim strategies, which can also have different skill levels. Discard strategies include: Oblivious, Cautious, Balanced. Claim strategies include: Chicken, High Roller, Dynamic. Selecting Random will pick randomly among the strategies and skill levels. If you leave the options as is, the computer player, at a minimum, will discard random tiles and not claim any sets.

- Discard

Oblivious selects the least useful tile without regards for already exposed tiles.

Cautious selects the least useful tile to others, judging by exposed tiles, and tries avoiding 包.

Balanced is a blend of Oblivious and Cautious.

- Claim

Chicken wants the fastest win, usually resulting in minimal points (雞糊), by claiming any meld. At higher skill levels, the computer knows which tiles are worth more points and when not to claim (for example, claiming a 1 if you have {123} is usually counter-productive).

High Roller wants maximum points. From the opening deal, the computer calculates the probabilities

for attaining each scoring factor, prioritizes the highest probability, and goes for it.

Dynamic is similar to High Roller but periodically calculates the probabilities for most expected points, which may change as the hand progresses, to guide its decisions.

6.2 Menu Commands

Match

New brings up the Setup window to start a new match.

Practice mode helps players who are learning the game by revealing the tiles of all players. Mode can be toggled on/off.

Window

Tile Tool Tips mode shows brief descriptions for a tile. Position the pointer over a tile for at least a second. Mode can be toggled on/off.

Main Window opens the main playing window. This menu item appears only if the playing window has been closed. You may also click MJ's icon in the Dock.

6.3 Preferences

The Preferences window groups preferences according to General and Classic Scoring. In the General tab, you may save players' names

for future starts. You may also adjust the computer player's action delay between 0–5 seconds in half-second increments. During a computer player's turn, each action step is delayed by this many seconds, giving you time to see who discarded and claimed which tile. If you want immediate play, set the delay to 0.

In the Classic Scoring tab, you may customize the values for all scoring factors as well as decide which full points patterns are in effect to suit your style of play. While the full points value is usually equal to the points limit, if you want no points limit, set it to 0. The Reset button restores the preset values, so feel free to experiment. The computer player uses the point values to evaluate tiles in its playing strategies. The preset values are the values my father plays.

6.4 Main Window

Besides depicting the virtual table and play pieces, the main window has some interface elements unique to a virtual representation.

6.4.1 Tiles

Organize your tiles as you like.

- Rearrange your tiles' positions by dragging them around.
- Rotate a tile with a double click.
- Toggle a tile's selection with a click; selection is indicated with a black outline.

6.4.2 Action Buttons

The action buttons within your player area are dimmed to indicate when that action is unavailable to you.

上 declare seuhng. If you have a choice of tiles to complete the meld, a dialog appears with available choices.

碰 declare pung.

槓 declare gong. If you have a choice of gong, a dialog appears with available choices.

食啦 (sihk la) declare a winning hand.

摸牌 (mo paaiah) draw a tile. The tile is automatically selected.

不要 (bat yiu) pass, on a claim.

打牌 (da paaiah) discard a tile. First select a tile, then click this button.

6.4.3 New Hand Buttons

Within the upper player's area are buttons to begin a new hand. These buttons appear and disappear as appropriate.

洗牌 (sai paaiah) shuffle the tiles and build the walls.

打骰子 (da sik ji) roll the dice. When a computer player is dealer, it automatically rolls the dice.

執骰子 (jap sik ji) pick up the dice. Click any of the dice to pick them up. MJ proceeds automatically to opening deal

followed by opening replacement. When a computer player is dealer, it automatically picks up the dice. Hence, clicking the dice has no effect unless you are dealer.

6.4.4 Miscellaneous

The following notes explain MJ's visual cues or operations.

- The dealer marker is positioned near the front of a player's area, towards the Wall. Besides showing the prevailing wind, the marker also indicates the current player's turn by its orientation. It appears right-side up for the current player.
- When you have drawn a flower or declared a gong, a replacement tile is drawn automatically for you.
- Gong melds appear with one tile stacked on top of the other three to form a pyramid. The top tile is face down when indicating a concealed gong (暗槓).
- Concealed (暗) pung sets in the scoring summary appear with one tile stacked on top of the other two to form a pyramid.
- Near each player's name is their consecutive wins counter, for the purpose of the thirteen consecutive hands scoring factor. According to other rule sets, this rule should apply only for the dealer and may not include ties. MJ does count non-dealer wins and ties, though winning thirteen consecutive hands still seems impossible.

- After declaring *sikh la*, the scoring summary for all players appears in the Floor area. If you think there is a scoring error, please check the scoring values in the Preferences window. If you still have a question, take screen shots {Shift-Command-3 (⌘⌘3)} of both and email them to me.

6.5 Live Play

For the beginner with little experience, this section describes some of the human elements, common in live play, which cannot be replicated in the computer. Many of these elements make the game more socially engaging and stimulating. They are also culturally significant to merit some explanation.

When the dealer marker cycles back to the starting dealer, that player is responsible for updating the dealer marker to the next prevailing wind and announcing it to all players. Some *mj* game sets include a separate marker (起莊牌) identifying who was the starting dealer.

Before each individual game, all players help shuffle the tiles. While shuffling, the tiles should be kept face down, though in live play, players may be relaxed in this regard. A common theme in *mj* is a fast play style, and shortcuts are common where strictly following rules may be inconsequential. If you notice a player trying to take advantage by remembering where certain tiles are placed, use discretion to find a friendly solution. Another common theme is the self policing nature among four players. In general, play nice or do not play at all.

In live play, players should declare their intended meld loudly and within an acceptable time period since the next player will want to proceed with the next turn. Common etiquette would allow some time following a discard for think and reaction time to declare a meld before drawing the next tile. If players operate at different speeds, either try to follow the speed of other players, or find other players at your speed. If you are unsure whether to claim, quickly and politely ask for extra think time.

6.5.1 Errors

In live play, human errors may occur and be penalized. Some examples include forgetting to draw a replacement tile or drawing too many. Before starting a live match, players should agree upon whatever penalties are appropriate. In practice, these decisions are usually made as necessary. *MJ* allows only valid game play actions, so the player can ignore the possibility of errors.

APPENDIX

A Contact

To contact Z0, see the Z0 website [11] and click Contact to use an anonymous form, or send email to `<address@zzz0.org>` where *address* is any address at all. Constructive comments and suggestions are appreciated.

MJ is distributed as shareware. Bug reports and donations are much appreciated. If donating money support, I would put more priority to your bug reports or feature requests, assuming I know that you donated. That means donors are anonymous unless you say so. Supporters who remain anonymous have my utmost thanks.

B Credits

Apple and OS X are trademarks of Apple Inc., registered in the United States and other countries. Unicode is a registered trademark of Unicode, Inc. in the United States and other countries.

MJ is designed and developed by Jerry Hom. Artwork for the application icon, flower tiles, and 1-bamboo (bird) tile were contributed by Leah Hom (niece, 11 years old at the time). MJ and its accompanying manual are Copyright 2015–2020 Jerry Hom.

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C Classic Scoring Tables

Point modifiers:

- pung, end|honor = $2 \times$ pung, middle
- gong = $4 \times$ pung
- concealed = $2 \times$ exposed

2	pair, dragon
2	pair, wind, seat prevailing
2	pung, middle & exposed
2	win on eyes
2	win on center seuhng (卡隆)
2	win on edge seuhng (偏章)

Point scoring factors.

30	win
2	win by self-draw (自摸)
4	flower (花)
0	win, concealed
30	win, seuhng (平糊)

Bonus point factors.

1	pung, dragon
1	pung, wind, seat prevailing
1	flower, seat (正花)
0	win, concealed by self-draw
1	win, pure seuhng (清平糊)

Double scoring factors for point factors.

1	lesser 3 dragons (小三元)
1	lesser 4 winds (小四喜)
1	flower group (一檯花)
0	win on flower
1	win on gong (槓上花)
1	win on stolen gong (搶槓)
1	win on last tile
0	win, 3 concealed pung
0	win, 3 gong
0	win, middles
0	win, ends and honors
1	win, initial hand
2	win, pung (對對碰)
2	win, mixed, 1 suit (混一式)
3	win, pure, 1 suit (清一式)

Double scoring factors by tile patterns.

	greater 3 dragons (大三元)
	greater 4 winds (大四喜)
✓	win, 7 flowers
	win, gong on gong (槓上槓)
	win, 4 concealed pung
	win, 18 Arhats (十八羅漢)
	win, honors (全番子)
	win, greens (綠一色)
	win, ends (清么九)
✓	win on first tile
✓	win, 9 Gates (九子連環)
✓	win, 13 Orphans (十三么)
	win on flower, 5-circle
	win on stolen gong, 2-bamboo
	win on last tile, 1-circle
	win, 13 consecutive

Full points tile patterns.